XX.—*Synopsis of the Fructification of the Compound* Sphæriæ *of the Hookerian Herbarium.* *By* Frederick Currey, *Esq., M.A., F.R.S., F.L.S.*

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THE title of this paper discloses the source from which the materials for it have been derived; and before proceeding with it, I am desirous, in the first place, to record my great obligations to Sir William and Dr. Hooker, through whose kindness and liberality I have been enabled to carry out those detailed examinations, the results of which, so far as they are completed, are embodied in the following pages.

Amongst the numberless treasures of the unrivalled Hookerian herbarium is a large collection of fungi belonging to the genus *Sphæria*. This genus, as originally limited, is the most extensive in the fungal alliance.

Its magnitude may be inferred from the fact, that in the second volume of Fries's 'Systema Mycologicum,' published thirty-five years ago, no less than 528 species are described; and since that time vast numbers of new species have been added, which are to be found in Fries's 'Elenchus Fungorum;' in the papers published from time to time in the 'Annales des Sciences Naturelles,' by M. Desmazières; in the 'Sylloge Plantarum Cryptogamarum' of Dr. Montagne; in the "Notices of British Fungi," by Messrs. Berkeley and Broome, contained in the different volumes of the 'Annals of Natural History;' in the 'Micromycetes Italici' of De Notaris, and in other scattered and less accessible sources of information.

In so extensive a genus it will necessarily follow that, for the correct determination of species, many aids must be necessary; and accordingly in the 'Systema Mycologicum' the genus is broken up into two great divisions, viz. the "Compositæ," in which the perithecia are united by a common stroma; and the "Simplices," in which the perithecia are solitary. These divisions again are separated into sections, and the sections into subsections, the details of which, so far as relates to the *Compositæ*, which are the subject of the present paper, will be given hereafter.

These details are necessary, because in the Hookerian herbarium the *Sphæriæ* are arranged in accordance with the 'Systema Mycologicum;' but it should be observed that in his subsequent work, the 'Summa Vegetabilium Scandinaviæ,' published in 1849, Professor Fries has abandoned his former arrangement, and formed or adopted several new genera instead of the subdivisions of the 'Systema Mycologicum.' These new genera have been generally adopted by Continental mycologists; and there is an evident tendency to increase their number. The present, however, is an epoch of transition in the classification of fungi, as may be inferred from the fact that within the last year two rearrangements of the family have been proposed—one by Dr. Bail in Germany, the other by Mr. Henfrey in this country. Neither of these authors professes to enter into minute details: but their systems, as far as they go, have very little in common; and the latter of them is

quite subversive of existing notions. Whether either of them will have any permanence, it would be premature to speculate, especially in the face of Dr. de Bary's observations on the ascigerous fructification of *Agaricus melleus*, lately communicated to the meeting of German naturalists at Bonn*. If these observations should be confirmed, it is hardly likely that the case of *Ag. melleus* should be a solitary one; and if ascigerous fructification should be proved to exist in the Agarics generally, one great line of demarcation in the classification of fungi, and upon which all systems are more or less founded, will be almost obliterated.

In the tribe of the *Pyrenomycetes*, to which the genus *Sphæria* belongs, the limits of genera are far from settled: for the researches of Tulasne and others have gone far to show that many of the existing genera are only stages of growth or abnormal conditions of other well-known plants of the same tribe; and it remains to be seen whether future mycologists will confirm the numerous genera into which the original genus *Sphæria* has been split up, or whether their judgment will not eventually favour the adoption of the arrangement of the 'Systema Mycologicum.'

However this may be, there is no doubt that many, if not most, of the later genera are exceedingly well defined; and I have therefore thought it advisable in the following descriptions, whilst adhering to the earlier arrangement as being that in use at Kew, to notice in each case the genus to which, according to more recent views, each particular plant would belong.

The present paper is the commencement of an attempt to render the discrimination of species in this extensive and intricate genus more certain and easy than it has hitherto been, by means of drawings and detailed descriptions of the fructification of each particular plant.

It will have been observed by all who have consulted the 'Systema Mycologicum' that no notice is taken of the nature of the fruit as distinctive of species: nor could such notice be expected; for at the time of the publication of that work, microscopical appliances were quite insufficient to render the necessary observations inviting, or even feasible.

The 'Summa Vegetabilium Scandinaviæ' contains some general allusions to the nature of the sporidia; but detailed descriptions were not within the scope of that work, which professes only to be a Syllabus of Scandinavian vegetation.

For some time past, however, the importance of the fructification as distinctive of species has been fully recognized; and any details of new plants would at the present day be considered imperfect which did not afford full descriptions of the fruit.

Figures of the sporidia of a number of species are to be found in the pages of the 'Annales des Sciences Naturelles,' in the works of Dr. Montagne, De Notaris and others; and the "Notices" in the 'Annals of Natural History' above referred to, and which relate to new species discovered in this country, are illustrated by excellent drawings. After all, however, the whole mass of the older species remain, so far as regards their fructification, almost entirely undescribed; and I have long thought that good service might be rendered to Mycology by any botanist who would undertake the description and illustration of the fruit of any considerable number of these plants. The opportunity of

* See Bot. Zeitung, No. 45, 1857.

doing so having been kindly accorded to me, I have done my best to avail myself of it, and have now the honour of laying before the Linnean Society a "Synopsis of the fructification of the compound *Sphæriæ* of the Hookerian herbarium." In describing the nature of the fruit, the points to be particularly attended to are, 1st, the number of sporidia in each ascus; 2ndly, their mode of arrangement in the ascus, *i. e.*, whether in one row, in two rows, or in a crowded and irregular manner; 3rdly, the shape of the sporidia; 4thly, their colour; 5thly, their structure, *i. e.*, whether unicellular and simple, or divided by septa, which latter may be transverse, or transverse and longitudinal, or even oblique; and 6thly, the length of the sporidia. The shape of the asci varies so much, not only in the same species, but in the same specimen, that I do not think it a character to be relied upon.

In the great majority of cases the number of sporidia is eight, very rarely it is less, in a few instances the number is sixteen, and in a few others the number is unlimited.

The mode of arrangement in the ascus, although tolerably constant, is not a very certain characteristic. There are many species in which uniseriate and biseriate sporidia may be found even in the same perithecum.

The shape and colour of the sporidia are very constant, and sure marks of distinction. With regard to colour, however, it must be remarked that it is different at different periods in the growth of the plant. For instance, in a very common species, *S. stercoraria*, Sow., the sporidia are colourless at first, they then assume a rich sea-green sort of colour, and eventually become quite black and opaque. It might be supposed that the darker colour evidenced the maturity of the plant, but I doubt if this is so, for I have seen the sporidia of *S. stercoraria* when in their colourless state germinate as actively as those of the darker shade.

The structure of the sporidia when perfect is also a very safe guide, but it is to be observed that there are many species in which the sporidia rarely attain their perfect state. This is particularly to be seen in some species of the division "Villosæ," where the sporidia when perfect are of a dark brown colour, and divided by numerous septa, but where the sporidia (although attaining their full size) more frequently remain simple, continuous, and colourless. *Sphæria Corticis* one of the *Obtectæ* is another striking instance of this peculiarity. The sporidia in this species are almost always colourless and simple, whereas in the perfect state (to which as far as my observations go they seldom attain) they are of a dark rich brown colour and divided by several septa.

I may here observe, that it is important to distinguish between real and apparent septa; it is not uncommon in unicellular sporidia to find the endochrome divided into two or more portions, and if these portions of the endochrome touch one another, the line of contact often appears so like a real partition that it is not always easy to ascertain whether in fact any septum exist or not.

The presence of nuclei is a point of structure which should be noticed in describing sporidia, but it is a characteristic of no great certainty, the sporidia in the same species being often found indifferently either with or without nuclei, and the number of them also is variable. In some plants, however, as in the sporidia of *S. verrucæformis*, and of some *Hypoxyla*, they are invariably to be met with.

Micrometric measurements of length should always be given. The size of sporidia is of course subject to variations dependent upon the circumstances of growth of the plant producing them, but as a general rule these variations take place within narrow limits. It not unfrequently happens that the sporidia increase in size after their escape from the ascus, so that measurements taken from specimens in which the asci have disappeared, will often be found to exceed the mean lengths of the sporidia when measured in the interior of the ascus.

I will conclude these introductory observations with a caution, superfluous to practised microscopists, but which may not be without its use to others who may consult the measurements here given; viz., that it is indispensable for correctness of observation to ascertain with accuracy the magnifying power of their object-glasses. Opticians, as is well known, always furnish tables giving estimates of the magnifying powers, but the tables are not (nor do the opticians profess that they are) minutely accurate. They express, in fact, the magnifying power aimed at, not that actually attained; and it will be found in practice that in object-glasses of the same focal length, no two will magnify exactly the same number of diameters. In the measurement of objects so minute as the sporidia of many of the *Sphæriæ*, great accuracy is indispensable for avoiding erroneous conclusions. I need hardly add that the correct determination of the value of the micrometer divisions is equally necessary. The arrangement of the "Sphæriæ compositæ" according to the 'Systema Mycologicum' is subjoined, with the essential characters of the genus, sections and divisions.

SPHÆRIA, Hall.

Char.—*Perithecia* rounded, entire, perforated at the apex. *Asci* mixed with paraphyses, convergent, deliquescent. Sporidia various.

A. COMPOSITÆ.

Section I. Periphericæ.—*Perithecia* more or less divergent, situated in the periphery of the stroma; ostiola even, destitute of a neck.

Div. 1. Cordyceps.—*Stroma* club-shaped, erect, simple or branched, stipitate.

Div. 2. Poronia.—*Stroma* marginate, cupshaped, open. *Perithecia* ovate, situated in the disk of the cup only, destitute of a neck; ostiola even and prominent.

Div. 3. Pulvinatæ.—*Stroma* sessile, convex, more or less hemispherical, immarginate. *Perithecia* in the periphery of the stroma.

Div. 4. Connatæ.—*Stroma* widely effused, indeterminate, immarginate, plane, surrounding the perithecia, or arising from their confluence. *Perithecia* destitute of a neck, immersed in the stroma, or protruding.

Section II. Hypophericæ.—*Perithecia* vertical, immersed, covered with the stroma, and having an attenuated neck.

Div. 5. Glebosæ.—*Stroma* more or less effused, determinate, glebose, distinct from the matrix, at length rigid and brittle. *Perithecia* ovate, large, at first buried and mouthless, at length attenuated into a short neck; ostiola even.

Div. 6. Lignosæ.—*Stroma* effused, thin, plane, more or less determinate, connate with the matrix; circumscribed with a black line. *Perithecia* sunk down to the bottom of the stroma, crowded, with prominent ostiola.

Div. 7. Versatiles.—*Stroma* immersed, at length emergent, determinate, but confluent with the

matrix, not circumscribed (as in the Lignosæ) with a black line. *Perithecia* vertical, irregularly scattered through the stroma, their necks at first included in it, but at length exserted.

Div. 8. Concrescentes.—*Stroma* thin effused, indeterminate, never circumscribed, innate, not erumpent, formed from the matrix or from the confluence of the perithecia. *Perithecia* subglobose, vertical, irregularly aggregated, at first solitary, then confluent, emergent, attenuated into a short neck. No erumpent disk.

Section III. Amphipericæ.—*Perithecia* with elongated necks, convergent, circinating, surrounded by a spurious pustulate stroma.

Div. 9. Circumscriptæ.—*Stroma* formed from the matrix, more or less rounded, included in a proper black ventricose conceptaculum which is compressed at the apex. *Perithecia* scattered in the stroma, irregularly circinating, decumbent, with rather long, converging, ultimately umbilicate necks, bursting out from the conceptaculum.

Div. 10. Incusæ.—*Stroma* formed from the matrix, rounded, included below in a proper open dimidiate conceptaculum, covered above with the subcomate epidermis, through which it bursts, forming a somewhat waxy, more or less flat disk. *Perithecia* collected in the centre of the stroma, irregularly circinating, their necks perforating the disk, but less protruded than in the former tribe.

Div. 11. Obvallatæ.—*Stroma* cortical without any proper conceptaculum. *Perithecia* immersed in the inner bark, collected in a circle; ostiola collected into a disk.

Div. 12. Circinatæ.—*Stroma* none, or formed of the corroded matrix. *Perithecia* covered, simple, aggregated, arranged in a circle, more or less decumbent. Necks of the perithecia elongated, united, and perforating the epidermis, at length free. No conceptaculum or heterogeneous disk.

Section IV. Epipericæ.—*Perithecia* naked, destitute of a neck, collected upon a stroma (which is often spurious) at first covered by the matrix.

Div. 13. Cæspitosæ.—*Stroma* rounded, determinate, convex. *Perithecia* superficial, simple, free, without elongated necks.

Div. 14. Confluentes.—*Stroma* thin rounded or effused, indeterminate, innate, arising principally from the confluence of the perithecia. *Perithecia* simple, connate, at first innate, then erumpent.

Div. 15. Seriatæ.—*Stroma* thin, effused, indeterminate, formed from the corroded parenchyma of the matrix, sometimes altogether wanting. *Perithecia* seated on the stroma, covered at first with the adnate epidermis, at length almost naked, disposed in parallel rows, often connate; ostiola short.

Div. 16. Confertæ.—*Stroma* when present effused, formed from the parenchyma of the leaf, more often wanting. *Perithecia* aggregate, nestling under the epidermis of dead or dying leaves.

In the 'Summa Vegetabilium Scandinaviæ,' the *Sphæriæ* included in the above divisions are thrown into distinct genera, the main characters of which, such of them at least as include the plants to which this paper relates, are given in that work as follows :—

1. Cordyceps.—*Stroma* vertical, clavate or capitate, fleshy; *perithecia* pale-coloured; *sporidia* very numerous, arranged in moniliform rows.
2. Xylaria.—*Stroma* vertical, clavate, between fleshy and corky, or leathery; *perithecia* horny, black, at first immersed in the stroma. *Sporidia* eight in an ascus, usually uniseptate*.

* This last character is by no means to be relied on; the sporidia are very frequently not septate. They have sometimes two nuclei, and when these latter are large and close to one another, there may be an appearance of a septum where none really exists.

3. Poronia.—*Stroma* between vertical and horizontal, suberoso-fibrous; *perithecia* collected in a marginate disk. *Sporidia* black.
4. Hypocrea.—*Stroma* horizontal, sessile. The genus is intermediate between *Cordyceps* and *Nectria*, and differs from *Hypoxylon* precisely as *Cordyceps* does from *Xylaria**.
5. Hypoxylon.—*Stroma* horizontal, sessile, homogeneous, discrete from the matrix, covered at first with a floccose furfuraceous veil. *Sporidia* opaque. Intermediate between *Xylaria* and *Sphæria*.
6. Diatrype.—*Stroma* formed (in part at least) from the matrix: *perithecia* sunk in the stroma; necks of the perithecia elongated and often prolonged into a beak. *Sporidia*† pellucid, simple, not opaque or bilocular, as is common in the *Hypoxyla*.
7. Valsa.—*Perithecia* circinating with long converging necks; ostiola connate or united into a disk.
8. Nectria.—*Stroma* none. *Perithecia* pallid, free, but often seated on a tuberculate mycelium of a variable nature, membranous, flaccid, brightly coloured. *Sporidia* 8 in an ascus, pellucid (very often, I may add, uniseptate).
9. Sphæria.—*Perithecia* carbonaceous, black, superficial and bicorticate, or immersed and then of a thinner texture; papillate, sometimes beaked. *Asci* octosporous, mixed with paraphyses, sporidia normally septate or cellular, but often simple, ejected like powder.

Div. I. Cordyceps.

1. S. (Cordyceps) Gunnii, Berkel. Decades. The asci produce long filamentous sporidia, which probably eventually break up into joints, as is the case with other *Sphæriæ* of this division: the sporidia have an alga-like appearance, with an undulating or horned outline; the transverse divisions are sometimes very indistinct; each division measures about 0·0002 inch. Tab. XLV. fig. 1 represents an ascus × 225 diameters; and fig. 2 a somewhat smaller ascus ruptured, with the sporidia protruding, × 450. The undulating outline may be caused by the shrinking of the fruit in drying. Robin, in his 'Végétaux Parasites,' describes the spores as "courtes, tronquées, cylindriques."
2. S. (Cordyceps) militaris, L.; Fr. S. M. p. 323. The asci produce long sporidia, which break up into minute joints. Tab. XLV. fig. 3 *a* shows an ascus × 220; and *b* a portion of some of the filaments with the joints into which they divide, more highly magnified.
3. S. (Xylaria?) pileiformis, Berkel. Tab. XLV. fig. 4, ascus and sporidia, and free sporidia, × 325. Sporidia uniseriate, dark reddish brown, irregularly almond-shaped, 0·0003 inch long.
4. S. (Xylaria) pedunculata, Dicks.; Sow. t. 437. Tab. XLV. fig. 5, ascus with sporidia, and free sporidia, × 225. Sporidia biseriate or uniseriate, clear brown and granular at first, eventually quite black, almond-shaped or elliptical, at or before maturity surrounded by a gelatinous envelope, 0·0015 to 0·0018 inch long.
5. S. (Cordyceps) entomorrhiza, Dicks.; Fr. S. M. p. 324. Tab. XLV. fig. 6, × 225.

* Fries remarks (*l. c.*), that *Hypocrea* is hardly distinguishable from *Cordyceps*, except by its stroma, but that the sporidia are often uniseptate. I may add, that in many species of *Hypocrea* the sporidia consist of squarish or subglobose hyaline bodies, 16 in each ascus, exhibiting a marked departure from the fruit of any other division.

† This description of the sporidia, although correct for a good many of the species, is by no means universally applicable, as will be seen by reference to the figures here given of the fruit of *Diatrype lanciformis, quercina*, &c.

The asci produce colourless jointed sporidia, which divide at the joints. The latter are rod-shaped or cylindrical, 0·0003 inch long, and are shown separately at *b*, *a*, being an ascus with its contained sporidia.

6. S. (Cordyceps) ophioglossoides, Ehrh.; Fr. S. M. ii. p. 324. Tab. XLV. fig. 7 *a*, an ascus × 225, *b* and *c* joints of the filaments more highly magnified. The asci produce jointed sporidia, which divide at the joints, each joint measuring about 0·0001 inch in length. I find them cylindrical, not oval or elliptical as figured by Robin and Berkeley. When free they often appear quite circular (see fig. 7 *c*), and to consist of an outer membrane and a very highly refractive nucleus. This circular appearance may arise from a change in the line of sight, although I think it probable that the joints, when freed from their mutual pressure, may assume a globular form.
7. S. (Xylaria) involuta, Kl. Tab. XLV. fig. 8, ascus with sporidia, × 325. Sporidia uniseriate, dark brown, elliptical or sub-reniform, 0·0007 inch long. The surface of this plant, when dry, breaks away from the flesh like a shell, carrying the perithecia with it, and the same thing occurs in *S. Guianensis*, post.
8. S. (Xylaria) Guianensis, Mont. Syll. p. 202. Tab. XLV. fig. 9, ascus and sporidia, × 325. Sporidia uniseriate, brown, rather dark, elliptical or slightly curved, 0·0006 inch long.
9. S. (Cordyceps) capitata, Holmsk. Fr. S. M. p. 324. Tab. XLV. fig. 10 *a*, ascus with sporidia; *b*, free joints, × 225. The asci produce jointed colourless sporidia, as in *S. militaris*, &c. The joints are rod-shaped or cylindrical, 0·0006 to 0·0008 inch long.
10. S. (Hypoxylon) Cœnopus, Mont. Tab. XLV. fig. 11, sporidia, × 325, sporidia clear brown, curved, elliptical or plano-convex, 0·001 inch long. This plant is from Guiana, from Leprieur and Montagne's collection. I doubt if it is distinct from *S. deusta*, Hoff. It should, I think, be arranged in the Glebosæ.
11. S. (Xylaria) polymorpha, Pers. Fr. S. M. p. 326. Tab. XLV. fig. 17, ascus with sporidia, and a free sporidium, × 325. Sporidia uniseriate, dark reddish brown, curved slightly, 0·0003 to 0·0004 inch long.
12. S. (Hypoxylon or Poronia) heliscus, Mont. Syll. p. 209. Tab. XLV. fig. 13, sporidia, × 325. Sporidia uniseriate, I think (but there were no complete asci), dark brown, irregularly almond-shaped or pyriform, 0·0003 to 0·0004 inch long. This plant was described by Montagne in Cent. ii. No. 44. t. 10. f. 5, under *Hypoxylon*; but in the 'Sylloge' it is transferred to *Poronia*.
13. S. rhopaloides, Mont. Tab. XLV. fig. 14, ascus with sporidia, × 325. Sporidia uniseriate, dark (rather reddish) brown, elliptical, but irregular in shape, 0·0003 inch long. *Hypoxylon*, Fr.
14. S. (Hypoxylon) crenulata, Berkel. Tab. XLV. fig. 15, sporidia, × 325. Sporidia biseriate, greenish, slightly curved, endochrome usually divided into four portions, giving a triseptate appearance, 0·0007 to 0·001 inch long. Sporidia occasionally uniseriate and overlapping, endochrome sometimes divided into 3 portions only.
15. S. (Xylaria) digitata, Pers. Fr. S. M. p. 326. Tab. XLV. fig. 16, ascus with sporidia, × 325. Sporidia uniseriate, dark brown, curved, 0·0007 inch long. When unripe, transparent with one or two nuclei.

16. S. (Xylaria) hypoxylon, Linn.; Fr. S. M. p. 327. Tab. XLV. fig. 17, ascus and sporidia, × 325. Sporidia uniseriate, dark brown, elliptico-acuminate, but often subcymbiform, 0·0004 inch long, usually with two nuclei, sometimes with one.
17. S. (Xylaria) microceras, Mont. Tab. XLV. fig. 18, ascus with sporidia, × 325. Sporidia uniseriate, brown, elliptical, rather irregular, 0·0004 inch long.
18. S. (Xylaria) multiplex, Kze. Linn. vol. v. p. 536. Tab. XLV. fig. 19, ascus with sporidia, × 325. Sporidia uniseriate, dark brown, plano-convex or irregular elliptical 0·0004 inch long.
19. S. (Xylaria) corniformis, Mont. Tab. XLV. fig. 20, ascus with sporidia, × 325. This plant is marked in Hook. Herb. "*Hypoxylon corniforme, an Sphæria corniformis*, Fr." The sporidia are uniseriate, almond-shaped, double- or plano-convex, rather dark brown, 0·0004 inch long. In fig. 21 I have drawn an ascus with sporidia (× 325) of *S. corniformis*, Fr. The sporidia are considerably larger than the above, and are furnished with one or two nuclei in each. There are many species, however, in which the size of the sporidia varies even to as great an extent as is shown in the difference between figs. 20 and 21; and the existence or non-existence of nuclei depends upon age and other circumstances to such an extent that they afford no safe characteristic. I think *S. corniformis*, Fr. and *Hypoxylon corniforme*, Mont., must be the same. Mr. Berkeley thinks they may possibly be distinct, the former being European, the latter tropical. Dr. Montagne's plant is rather a *Xylaria* than a *Hypoxylon*.
20. S. (Xylaria) ianthino-velutina, Mont. Syll. p. 204. Tab. XLV. fig. 22, sporidia, × 225. Sporidia uniseriate (I think, but there were no perfect asci), brown, irregularly almond-shaped or pyriform, 0·0005 long. The perithecia are rather larger, with velvety hair between them.
21. S. (Xylaria) carpophila, Pers.; Fr. S. M. ii. p. 328. Tab. XLV. fig. 23, ascus with sporidia, × 325. Sporidia uniseriate, clear, light brown, elliptical or slightly reniform, with one or two nuclei, 0·0004 inch long.
22. S. (Cordyceps) alutacea, Pers. The fructification of this plant is not distinguishable from that of *S. rufa* (see post). It is a *Cordyceps* with the fructification of *Hypocrea*.
23. S. (Hypoxylon) sagræana, Mont. Tab. XLV. fig. 24, sporidia, × 450. Sporidia obtusely elliptical, sometimes slightly incurved in the middle, clear (rather dark) brown, obtuse or almost square at the ends, 0·0004 inch long.
24. S. (Cordyceps) purpurea, Fr. Tab. XLV. fig. 25 *a*, ascus with sporidia, × 325; *b*, free sporidia more highly magnified. Sporidia colourless, filiform, attenuated at each end, variable in length, 0·002 to 0·003 long, or even more. It is difficult to count the sporidia, but I should guess them at eight; I found them always entirely filling the ascus, which is very long and narrow, and in my specimens not so clavate as the figures in the Micrographic Dictionary, which are reduced from Tulasne's figures in the 'Ann. des Sciences.'—This and the following plant are placed in a distinct genus (*Claviceps*) by Tulasne. They differ altogether in fructification from the moniliform fruit of *Cordyceps*.
25. S. (Cordyceps) microcephala, Tul. The fruit in my specimens differs in no respect

from that of *S. purpurea*, except that the hyaline knob at the apex of the ascus is very distinct in each ascus; one ascus which I measured was 0·002 inch, another 0·0034 inch long; so that their length is very variable. The sporidia entirely fill the ascus, as in *S. purpurea*, but I think they sometimes, if not always, overlap one another, so that their length is not always equal to that of the ascus.

26. S. (Cordyceps) Robertsii, Hook. Tab. XLV. fig. 26, ascus with fruit, × 425. The fruit here, as in the other true species of *Cordyceps*, consists of long colourless sporidia, which break up into joints. At least, the sporidia are divided by septa into a number of small portions, which probably separate from one another at the partitions, as in *S. militaris*, *capitata*, &c. The septa are sometimes very indistinct.

26*a*. S. (Cordyceps) typhina, Pers. Fr. S. M. ii. p. 553, under *Dothidea*. The fructification is almost identical with *S. militaris*, although the asci are smaller.

Div. 2. Poronia.

27. S. (Poronia) punctata, Sow. Tab. XLV. fig. 27, ascus with sporidia, × 325. Sporidia uniseriate, brown when young, and then slightly granular, quite black and opaque when ripe, elliptical, varying in length from 0·0008 to 0·0012 inch.

Div. 3. Pulvinatæ.

28. S. (Hypoxylon) multiformis, Fr.! S. M. ii. p. 334. Tab. XLV. fig. 28, ascus with sporidia, × 450. Sporidia uniseriate, rich yellowish-brown, elliptical, but usually slightly curved, 0·0004 inch long.

29. S. (Hypoxylon) durissima, Sz.; Fr. S. M. ii. p. 335. Tab. XLV. fig. 29, ascus with sporidia, × 325. Sporidia uniseriate, clear dark brown, elliptical, but frequently slightly curved, 0·0003 to 0·0004 inch long. This plant is marked with a ?; and it seems doubtful whether it is not a form of *S. multiformis*. The perithecia are blacker and rather more dome-shaped than in my specimens of *S. multiformis*, and they have a decided nipple-shaped ostiolum. The sporidia have usually one good-sized nucleus, sometimes two, or even more.

30. S. (Hypoxylon) fragiformis, Pers.; Fr. S. M. ii. p. 332. Tab. XLV. fig. 30, sporidia, × 325. Sporidia uniseriate?, dark opaque brown, elliptical or arcuate, with sometimes one or two nuclei visible, but mostly too opaque for the nuclei to be seen; 0·0006 inch long.

31. S. (Hypoxylon) annulata, Mont. (β. *depressa*). Mont. Syll. p. 213. Tab. XLV. fig. 31, sporidia, × 450. Sporidia light brown, elliptical, 0·0003 inch long.

32. S. (Hypoxylon) concentrica, Bolt. Fr. S. M. ii. p. 331. Tab. XLV. fig. 32, sporidia, × 325. Sporidia uniseriate, dark brown, sometimes with a large elliptical or reniform nucleus, elliptical, but sometimes of irregular shape, 0·0005 inch long.

33. S. (Hypocrea) gelatinosa, Tode; Fr. S. M. ii. p. 336. Tab. XLV. fig. 33, ascus with sporidia, × 325. Sporidia uniseriate, colourless, squarish in the ascus, more nearly round when free, with one or many, or with no nuclei, 0·0002 inch in diameter when free. Almost precisely similar in fructification to *S. rufa* (see *post*), and like that,

probably not a true *Sphæria*. In specimens in my own herbarium from Tunbridge Wells, each pulvinulus is seated upon a dense white byssoid subiculum, which becomes brown with age.

34. S. (Hypoxylon) vernicosa, Schwein. Tab. XLV. fig. 34, ascus with sporidia, × 315. Sporidia uniseriate, dark brown, elliptical, 0·0005 to 0·0006 inch long. Perhaps only a form of *S. concentrica*; but Mr. Berkeley considers it distinct in the structure of the stroma.

35. S. (Hypoxylon) argillacea, Fr. Obs. i. t. 2. f. 5. Tab. XLV. fig. 35, ascus with sporidia, × 325. Sporidia uniseriate, opaque black-brown, irregularly elliptical; sometimes one, two, or three nuclei, or a number of small nuclei, are visible.

36. S. (Hypocrea) rufa, Pers. Fr. S. M. ii. p. 335. Tab. XLV. fig. 36, ascus with sporidia, × 325. The sporidia are squarish colourless bodies usually 16 in each ascus, quite unlike the usual fructification in the Pulvinatæ. This plant agrees in its fructification with *S. citrina* and *S. lobata*, and, like *S. gelatinosa* and some others, comes very near to *Dothidea*; for the perithecia, as far as I can make out, have no walls distinct from the flesh of the stroma; so that the fructifying mass is in fact a "nucleus" in the sense in which that word is used in *Dothidea*.

37. S. pruinata, Kl. Linn. vol. viii. p. 489. Tab. XLV. fig. 37, ascus with sporidia, × 325. Sporidia uniseriate, dark brown, elliptical, with 1 to 4 nuclei, or with a dark curved band across, arising, I think, not from a septum, but from the approximation of the nuclei; varying slightly in length, but on an average 0·001 inch long. Perithecia crowded, dome-shaped, with mammillate ostiola, mostly, but not always covered with a white farinaceous powder.

38. S. (Hypoxylon) fusca, Pers. Fr. S. M. ii. p. 332. Tab. XLV. fig. 38, asci with sporidia, × 325. Sporidia elliptical or almond-shaped; when young pale brown, with one or two large nuclei, and sometimes small nuclei also; when ripe very dark and opaque, normally uniseriate, but occasionally crowded as shown in fig. 39, which represents the fruit (× 225) of a *Sphæria* not differing materially from *Sphæria fusca*, except that the sporidia are larger and more irregular than usual. The latter plant occurred at Eltham, in Kent, in June, 1855. The ordinary length of the sporidia in *S. fusca*=0·0005 inch.

39. S. (Hypoxylon ?) parmularia, Berkel. Tab. XLV. fig. 40, sporidia × 225. Sporidia rather dark brown, clear, with mostly one nucleus, irregularly elliptical or almond-shaped, 0·0004 inch long. The specimens are in a bad state; and I had some doubt whether the plant ought not to be referred to the *Connatæ* or *Confluentes*. There is, however, some appearance of the *débris* of a *Pulvinulus*.

40. S. (Hypoxylon) cohærens, Pers. Fr. S. M. ii. p. 335. Tab. XLV. fig. 41, ascus with sporidia, × 325. Sporidia uniseriate, rather dark brown, irregularly elliptical, frequently rather curved, often with one or two nuclei, 0·0003 to 0·0004 inch long.

41. S. (Hypoxylon) rubricosa, Fr. Fl. 2. p. 63. Tab. XLV. fig. 42, ascus with sporidia, × 325. Sporidia uniseriate, dark brown, eventually opaque, elliptical, uniseptate, with frequently a nucleus in each division, 0·0004 to 0·0006 inch long.

Div. 4. Connatæ.

42. S. (Hypoxylon) rubiginosa, Pers.; Fr. S. M. ii. p. 340. Tab. XLV. fig. 43, ascus with sporidia × 325. Sporidia uniseriate, dark brown, elliptical, but slightly irregular, usually with one, sometimes with two or even three nuclei, 0·0004 inch long.

43. S. (Hypoxylon) atro-purpurea, Tode; Fr. S. M. ii., p. 340. Tab. XLV. fig. 44, sporidia × 325. Sporidia dark brown, paler when young, usually with two, sometimes one nucleus, 0·0004 to 0·0005 inch long.

44. S. (Hypoxylon) perforata, Sz.; Fr. S. M. ii. p. 340. Tab. XLV. fig. 45, sporidia, × 325. Sporidia I think uniseriate, like those of *atro-purpurea*, but rather lighter-coloured, 0·0004 inch long. The plant is easily known by the rusty-coloured perithecia, and the white flat ostiola.

45. Sphæria botryosa, Fr. S. M. ii. 342. Tab. XLVI. fig. 46, ascus with sporidia, × 225. Asci variable in size, clavate, with the inner membrane very distinct, the latter filled with innumerable multitudes of very minute granules; granules colourless, about 0·0001 inch, endowed with Brownian motion. I should have doubted these granules being true sporidia; but I find the fruit of the plant in the Hookerian herbarium coinciding exactly with that of authentic specimens from the *Scleromycetes Sueciæ*. Fries considers the plant a *Sphæria* with confluent perithecia, and not an *Hypoxylon*. See 'Summa Veg. Scand.' p. 383, note 3.

46. S. (Hypocrea) lateritia, Fr. S. M. ii. p. 338. Tab. XLVI. fig. 47, ascus with sporidia, × 325. Sporidia uniseriate elliptico-acuminate, colourless, 0·0006 to 0·0007 inch long. I had some doubt whether the plants were ripe, and whether the sporidia may not become brown in age. The specimens in Hook. herb. are from Mr. Stephens's herbarium. I have seen no other specimens of this species.

47. S. (Hypoxylon) serpens, Pers.; Fr. S. M. ii. p. 341. Tab. XLVI. fig. 48, ascus with sporidia, × 325. Sporidia similar in colour to those of *S. atro-purpurea*, and of about the same size.

48. S. (Hypocrea) hyalina, Schwein.; Fr. S. M. ii. p. 339. Tab. XLVI. fig. 49, ascus with sporidia and free sporidia, × 325. Sporidia uniseriate, colourless or greenish, elliptico-acuminate but rather irregular, 0·0006 to 0·0008 inch long.

49. S. (Hypoxylon) Sassafras, Sz.; Fr. S. M. ii. p. 343. Tab. XLVI. fig. 50, ascus with sporidia, × 325. Sporidia uniseriate, elliptical, clear brown, rather dark, 0·0004 inch long. Very like *S. atro-purpurea*; but the perithecia are of a rather darker colour, and the ostiola obtuse or depressed, not mammillate.

50. S. (Hypocrea) citrina, Pers.; Fr. S. M. ii. p. 337. Tab. XLVI. fig. 51, ascus with sporidia, × 325. Sporidia squarish, irregular in shape, colourless, normally 16 in an ascus. Hardly distinguishable in fructification from *S. rufa*, &c., but easily known by the yellow colour, and effused condition of the stroma. It may be only a peculiar condition of *S. gelatinosa*, Tode.

51. S. (Hypocrea) lobata, Sz. Wormsk.; Fr. S. M. ii. p. 343. Tab. XLVI. fig. 52, ascus with sporidia, × 325. Not distinguishable in its fruit from the last, except that the asci and sporidia (in the Kew specimens at least) are smaller.

52. S. (Hypocrea) luteo-virens, Fr. S. M. ii. p. 339. Tab. XLVI. fig. 53 *a*, ascus with sporidia; *b*, free sporidia; *c*, stylospores, all × 325. Sporidia uniseriate; overlapping, colourless, very narrowly almond-shaped, 0·0008 to 0·0010 inch long. Perithecia dull-yellow orange colour, imbedded in a woolly subiculum which produces the yellow stylospores on the left of the figure.

Div. 5. Glebosæ.

53. S. (Hypoxylon) repanda, Fr. S. M. ii. p. 346. Tab. XLVI. fig. 54, ascus with sporidia × 325. Sporidia uniseriate, dark brown, elliptical, 0·0004 to 0·0005 inch long. Stroma rather undulating in surface, ostiola depressed, the whole plant very like *S. stigma*, except in its fruit, which is quite different.

54. S. (Hypoxylon) tubulina, A. and S.; Fr. S. M. ii. p. 346. Tab. XLVI. fig. 55, ascus with sporidia and free sporidia, × 325. Sporidia usually, I think, uniseriate, but sometimes biseriate, clear, rather dark brown, elliptical, 0·0002 to 0·0003 inch long.

55. S. (Hypoxylon) lutea, A. and S.; Fr. S. M. ii. p. 347. Tab. XLVI. fig. 56, ascus with sporidia, × 325. Sporidia minute, uniseriate, brown, elliptical, but rather irregular, generally with two nuclei, which sometimes give an appearance of a septum; sometimes there is one nucleus, sometimes none. Sporidia 0·0002 to 0·0003 inch long.

56. S. (Hypoxylon) deusta, Hoffm.; Fr. S. M. ii. p. 345. Tab. XLVI. fig. 57, sporidia, × 325. Sporidia biseriate I think (the asci were imperfect), rather dark brown, usually somewhat curved, with an inner membrane sometimes visible, 0·0012 to 0·0016 inch long.

57. S. (Hypoxylon ?) fuscospora, Schwein. Tab. XLVI. fig. 58, sporidia, × 325. Sporidia biseriate I believe, at first colourless, then clear dark brown, arcuate, 0·0014 inch long.

58. S. (Hypoxylon) nummularia, Bull.; Fr. S. M. ii. p. 348. Tab. XLVI. fig. 59, asci with sporidia, × 325. Sporidia uniseriate, brown when young, black when ripe, round or elliptical, 0·0004 to 0·0006 inch long.

59. S. (Hypoxylon) marginata, Fr. El. ii. 69. Tab. XLVI. fig. 60, ascus with sporidia, × 325. Sporidia uniseriate, with one, two, or no nuclei, elliptical or subreniform, 0·0002 inch long, pale clear brown.

Div. 6. Lignosæ.

60. S. Hypoxylon) uda, Pers.; Fr. S. M. ii. p. 358. Tab. XLVI. figs. 61 and 62, asci with sporidia, × 325. Fig. 63, free sporidia, × 325. Sporidia at first of a rich olive-green colour, eventually dark, clear, transparent brown, sometimes with nuclei, sometimes obtusely elliptical (fig. 61), sometimes almond-shaped (fig. 62). 0·0006 to 0·001 inch long.

61. S. (Diatrype) disciformis, Hoffm.; Fr. S. M. ii. p. 353. Tab. XLVI. fig. 64, sporidia, highly magnified. Sporidia biseriate or crowded, yellowish in a mass, almost colourless when detached, slightly curved; 0·0002 to 0·0003 inch long.

62. S. (Diatrype) flavovirens, Hoffm.; Fr. S. M. ii. p. 357. Tab. XLVI. fig. 65, ascus with sporidia, × 450. Sporidia crowded, yellowish, curved, 0·0003 inch long.

63. S. (Diatrype) platystoma, Schwein.; Fr. S. M. ii. p. 351. Tab. XLVI. fig. 66, sporidia, × about 450. Sporidia colourless or with a slight yellow tinge, less curved and rather smaller than in *Sphæria stigma*; about 0·0003 inch long. The plant is distinguishable from *S. stigma* by its rimose stroma, and by its larger, more protruding Pezizæ-form ostiola.

64. S. (Hypoxylon) vogesiaca, Pers. in Litt. Tab. XLVI. figs. 67 and 68, sporidia, × 325. Sporidia uniseriate (I believe), at first pale brown, eventually almost opaque with granules and nuclei, elliptical, but rather irregular, sometimes almost pyriform, 0·0007 to 0·0008 inch long. "*Ad truncos emortuos Aceris pseudo-platani*; *affinis Sphæriæ serpentis sed distincta*," is the note attached.

65. S. (Hypoxylon) virgultorum, Fr. S. M. ii. p. 351, El. xi. 71. Tab. XLVI. fig. 69, sporidia, × 450. Sporidia sometimes uniseriate, sometimes biseriate, lageniform, colourless, or with an almost imperceptible yellowish tinge, 0·0004 inch long.

66. S. (Diatrype) atro-punctata, Schwein.; Fr. S. M. ii. p. 351. Tab. XLVI. fig. 70, ascus with sporidia and free sporidia, × 325. Sporidia uniseriate, overlapping, brown, with granular nucleate contents, broadly almond-shaped, 0·0010 to 0·0012 inch long. Easily known by the small punctiform ostiola penetrating the white upper surface of the stroma.

67. S. (Diatrype?) rhois, Schwein.; Fr. S. M. ii. p. 356. Tab. XLVI. fig. 71*a*, sporidia; *b*, stylospores. The specimens are in bad condition; but one perithecium produced the sporidia *a*, which are yellowish like those of *Sphæria verrucæformis*; another produced the stylospores or spermatia *b*, which were colourless and produced on sporophores attached to the wall of the perithecium. Length of *a* about 0·0003 inch, of *b* from 0·0010 to 0·0014 inch, measured on the chord of the arc.

68. S. (Diatrype) liriodendri, Schwein.; Fr. S. M. ii. p. 356. Tab. XLVI. fig. 72, asci with sporidia and free sporidia, × 325. Sporidia very crowded, quite filling the asci, brown, just like the sporidia of *Sphæria favacea* and *S. aspera*, 0·0002 inch long, or rather more. Possibly the plant is only a state of *Diatrype aspera*.

69. S. (Diatrype) capnodes, Berkeley. Tab. XLVI. fig. 73, ascus with sporidia and free sporidia × 325. Sporidia uniseriate, at first a clear brown, ultimately quite opaque, uniseriate, elliptical, 0·0004 to 0·0005 inch long. This species is allied to *Sphæria stigma*; but the stroma is of a blackish grey colour, and the ostiola more prominent. The fruit, as will be seen, is totally different from that of *S. stigma*.

70. S. (Hypoxylon) melanaspis, Mont. Sylloge, p. 215. Tab. XLVI. fig. 74, ascus with sporidia and free sporidia, × 325. Sporidia uniseriate, overlapping at the ends, almost colourless, but with a faint tinge of yellow or rather straw colour, fusiform, but wider at one end than at the other, 0·001 inch long. Forming round black stains, with the ostiola slightly protruding in the middle of the stain.

71. S. (Diatrype) dryophila, n. s. Tab. XLVI. fig. 75, asci with sporidia and free sporidia, × 325. Sporidia uniseriate, narrowly elliptical, subacuminate at each end, at first of a pale greenish brown, then darker, and eventually almost black, when young with two or more nuclei in each sporidium, 0·0004 to 0·0005 inch long. Perithecia ovate or sub-globose surrounded by a dirty green stroma, rather deeply buried,

piercing the bark by their long converging necks, forming compact scattered black pustules on oak-branches. On dead and decaying branches of oak at Weybridge, September, 1856. Much resembling *Sph. verrucæformis* in its external form, and in the very glutinous nature of the contents of the perithecia.

72. S. (Diatrype) nucleata, n. s. Tab. XLVI. fig. 76, ascus with sporidia, × 325. Sporidia linear-acuminate, but constricted in the middle, colourless, 0·0007 to 0·0008 inch long. Perithecia ovate or globose, with rather short ostiola, collected in elongated irregular patches surrounded by a dark line. Weybridge, January, 1856, on furze.

73. S. (Diatrype or Valsa) varians, n. s. Tab. XLVI. fig. 77, ascus with sporidia, × 325. Sporidia biseriate, obtuse, constricted in the middle, colourless, with granular endochrome, uniseptate, 0·0006 inch long. Perithecia subglobose; ostiola conical, sometimes umbilicate at the apex. The masses of perithecia penetrate the bark in long parallel lines. This plant unites the characteristics of the Circumscriptæ and Lignosæ, some specimens having a conceptaculum, and others being scattered, with a black line and without a conceptaculum. Eltham, June 1855.

74. S. (Diatrype or Valsa) denigrans, n. s. Tab. XLVI. fig. 78, ascus with sporidia, × 325. Sporidia uniseriate, often partly overlapping, dark olive-brown, elliptical, bi-, tri-, or multi-nucleate, sometimes quite simple, 0·0005 inch long. Perithecia conical or depressed, with long ostiola, deeply set in the wood; ostiola penetrating the bark and raising the wood into minute but prominent black tubercles. When a nest of perithecia is cut transversely, there is a black line round them which is very well defined.

75. S. (Diatrype) inæqualis, n. s. Tab. XLVI. fig. 79, ascus with sporidia, × 325. Sporidia uniseriate, almost colourless, but rather of a green tinge, obtuse, constricted in the middle, uniseptate, 0·0006 inch long or a little over; contents granular and nucleate. Perithecia subglobose; ostiola short and rugose. The surface of the wood (beneath the epidermis) under which the perithecia lie is blackened and rugged; the perithecia are sometimes scattered. Masses of perithecia surrounded by a black line. Nearer to the Lignosæ than to any other division. On furze, Weybridge, January 1856.

76. S. (Diatrype) Badhami, n. s. Tab. XLVI. fig. 80, ascus with sporidia and free sporidia, × 325. Sporidia biseriate, colourless, usually 4-nucleate, with a minute hyaline appendage at each end (which, however, is invisible in the ascus), narrowly almond-shaped, 0·0005 to 0·0006 inch long without the appendages. The perithecia occur singly and in masses; they are deeply imbedded in the wood; the surface of the inner bark is much blackened. The plant in habit and appearance resembles *S. inæqualis*, supra; but the sporidia are altogether different.

77. S. (Diatrype) verrucæformis, Ehr.; Fr. S. M. ii. p. 355. Tab. XLVI. fig. 81, ascus with sporidia and free sporidia, × about 225. Sporidia very numerous, crowded, yellowish in the mass, almost colourless when single, curved, rounded at the ends, with usually a nucleus at each end, 0·0004 inch long. The asci are usually, but not always, fusiform.

78. S. (Diatrype) favacea, Fr. S. M. ii. p. 354.

79. S. (Diatrype) aspera, Fr. S. M. ii. p. 354. The only difference between the fructification of these plants and that of *S. verrucæformis* is that their sporidia are somewhat smaller and without nuclei, and their asci are clavate, not fusiform.

80. S. (Diatrype) stigma, Hoffm.; Fr. S. M. ii. p. 350. Tab. XLVI. fig. 82, sporidia, × 450. Sporidia yellowish in the mass, almost colourless when single, slightly curved, 0·0004 inch long.

81. S. (Diatrype) bullata, Ehr.; Fr. S. M. ii. p. 349. Sporidia just like those of *S. platystoma* (see fig. 66), 0·0002 to 0·0003 inch long.

82. S. undulata, Pers.; Fr. S. M. ii. p. 350. Sporidia biseriate, yellowish, slightly curved, rounded at each end, 0·0004 inch long. The perithecia break through the bark in an undulating manner. The sporidia are just like those of *Sphæria stigma* (see fig. 82), of which this species is probably only a variety, as was long since remarked by Fries.

83. S. (Hypocrea) lenta, Tode; Fr. S. M. ii. p. 349. Tab. XLVI. fig. 83, ascus with sporidia, × 325. The fructification of this plant is precisely similar to that of *S. rufa*; and I would refer to the remarks appended to that plant. The square-shaped, irregular, colourless sporidia, after escaping from the ascus, become round or nearly so, their average diameter being less than 0·0002 inch. I have retained the plant in this division, as it is so arranged in the Herbarium, and by Fries in the 'Syst. Myc.' In the 'Summa Veg. Scandinaviæ' it is placed (strange to say) in the genus *Diatrype*; according to the arrangement in that work, it ought certainly to be a *Hypocrea*.

Div. 7. Versatiles.

84. S. (Diatrype) scabrosa. Dec.; Fr. S. M. ii. p. 360. Tab. XLVI. fig. 84, ascus with sporidia and free sporidia, × 450. Sporidia uniseriate, clear brown (one had a hyaline tip at each end), subcylindrical, rounded at each end, triseptate, slightly constricted at the septa, 0·0006 inch long. In this specimen the perithecia are very slightly immersed, and look like large specimens of *Sphæria pulvis-pyrius*, which, although belonging to the Denudatæ, is often subcuticular in its growth. The fruit also is the same as in *S. pulvis-pyrius*, except as regards size. The plant, however, being marked *S. scabrosa* by Mr. Berkeley, I have described it as such, but with some doubt.

85. S. (Diatrype) podoides, Pers. Syn. p. 22, excl. syn. Tab. XLVI. fig. 85, ascus with sporidia and free sporidia, × 225. Sporidia biseriate or crowded, clear, rather pale-brown, 7-septate, with a hyaline joint at each extremity, often slightly curved, 0·0024 to 0·003 inch long. Quite distinct from *S. scabrosa*, Dec., under which it was placed by Fries as a variety.

86. S. podoides, var. lævis, does not differ from the above, as far as the fruit is concerned, but only in the smoothness of the tubercles, arising from the ostiola of the perithecia not penetrating the stroma.

87. S. (Diatrype ?) petiginosa, Fr. in litt. Tab. XLVI. fig. 86, ascus with sporidia and free sporidia, × 450. Sporidia biseriate or crowded, yellowish, rounded at each end, narrow, slightly curved, 0·0004 to 0·0006 inch long.

88. S. (Diatrype) leprosa, Pers.; Fr. S. M. ii. p. 365. Tab. XLVI. fig. 87, ascus with

sporidia and free sporidia, × 325. Sporidia biseriate or crowded, colourless or yellowish, slightly curved, 0·0004 to 0·0005 inch long, rounded at each end, narrow.

89. S. (Diatrype) strumella, Fr. S. M. ii. p. 365. Tab. XLVII. fig. 88, sporidia, × 450. Sporidia biseriate, colourless, elliptico-acuminate, triseptate, or, I think, pseudo-triseptate from the division of the endochrome into four parts, 0·0005 to 0·0006 inch long, sometimes slightly curved and slightly constricted in the middle, and frequently only biseptate.

90. S. (Diatrype) radicalis, Fr. El. ii. p. 73. Tab. XLVII. fig. 89, sporidia highly magnified. Sporidia biseriate or crowded, elliptical or subturbinate, colourless, hyaline very minute, 0·0002 to 0·0003 inch long, always, I think, with one, sometimes with two or three septa. The perithecia are deeply buried and surrounded by an orange-coloured stroma, through which the ostiola penetrate in the form of little, round, black, disc-like spots.

91. S. (Diatrype) quercina, Pers. Tab. XLVII. fig. 90, ascus with sporidia and free sporidia, × 325. Sporidia biseriate, endochrome 4-, sometimes 6-partite, oleaginous, but sometimes granular, 0·0020 to 0·0028 inch long. This plant has been much misunderstood. The above description is from a specimen lent to me by Mr. Berkeley. I doubt whether any of the specimens at Kew are the true species. Some of them are certainly *S. leiphæmia*; and the others are not in a sufficiently good condition to decide upon.

92. S. (Diatrype) lanciformis, Fr. S. M. ii. p. 362. Tab. XLVII. fig. 91, ascus with sporidia, × 325. Sporidia usually biseriate, but occasionally (when the sporidia are small, I think) uniseriate, pale clear brown, when ripe flatly elliptical, rather obtuse at the ends, the extreme tips frequently, if not always, pellucid, and the sporidium of a darker colour in the part immediately adjoining the pellucid tips. Length very variable, ordinarily 0·002 inch.

93. S. (Diatrype) hystrix, Tode; Fr. S. M. ii. p. 364. Tab. XLVII. fig. 92, asci with sporidia, × 325. Sporidia uniseriate or biseriate, elliptical, slightly constricted at the septa, 3- or 4-septate with frequently longitudinal and oblique septa, pale clear brown, 0·0006 to 0·0008 inch long. Described from a specimen out of Mr. Berkeley's herbarium, the plant at Kew not having perfect fruit.

94. S. (Diatrype) ceratosperma, Tode; Fr. S. M. ii. p. 364. Tab. XLVII. fig. 92, ascus with sporidia, × 325. Sporidia biseriate, colourless, simple, curved, 0·0003 to 0·0004 inch long. Described from a specimen of Mr. Berkeley's, the plant at Kew not being the true species.

95. S. (Diatrype) ferruginea, Pers.; Fr. S. M. ii. p. 363. Tab. XLVII. fig. 94, asci with sporidia, × 325. Sporidia very long, linear, acuminate at the ends, colourless, with many nuclei.

96. S. (Diatrype) nigerrima, Bloxam, MSS. Sporidia biseriate, closely packed, very irregular in shape (arcuate, subelliptical or lozenge-shaped), with a number of circular nuclei, colourless, but with a greenish tinge, 3-, 4-, or 5-septate. Perithecia irregularly ovate or conical, sometimes arranged in tiers, raising the matrix into a

black pulvinate tubercle, through which the densely crowded ostiola penetrate and cause a scabrous appearance; ostiola somewhat elongated and rounded. Communicated by Mr. Bloxam, from Leicestershire.

97. S. (Diatrype) irregularis, Sow.=*S. gastrina*, Fr. S. M. ii. p. 379. Tab. XLVII. fig. 96, ascus with sporidia, × 450. Sporidia at first colourless or pale green, at last dark brown, uniseriate; average length a little over 0·0004 inch. The sporidia have one, two, or three nuclei, and sometimes the nuclei are so close as to give a septate appearance to the sporidium; but I do not think there is ever any real septum.

98. S. (Diatrype) Mougeotii, Pers. in litt. Tab. XLVII. fig. 97, ascus with sporidia, × 325. Sporidia biseriate, yellow (the same colour as in *S. herbarum* and *S. siparia*), irregularly oblong, constricted in the middle, multi-septate, with frequently longitudinal septa (or rather pseudo-septa; for all the septa are, I think, only apparent, arising from divisions of the endochrome), 0·0012 inch long. Perithecia with deciduous (?) ostiola. Arranged in the herbarium with the *Cæspitosæ*, but clearly belonging to the *Versatiles*. On dried branches of *Acer Pseudo-platanus*.

Div. 8. Concrescentes.

99. S. fibrosa, Pers.; Fr. S. M. ii. p. 384. Tab. XLVII. fig. 98, ascus with sporidia, × 420. Sporidia uniseriate, obtusely elliptical, but slightly constricted in the middle, colourless; endochrome bipartite, 0·0005 inch long.

100. S. depressa, Fr.; Montagne, Sylloge, p. 232. Tab. XLVII. fig. 99, ascus with sporidia, × 325; detached sporidia, × 450. Sporidia curved, of a pale yellowish colour, each ascus containing a great number. Asci with their sporidia much resembling *Sph. favacea*; sporidia 0·0004 inch long.

101. S. parallela, Fr. S. M. ii. p. 373. Tab. XLVII. fig. 100, sporidia highly magnified. Sporidia pale clear brown, straight or slightly curved, rounded at each end, 0·0004 to 0·0005 inch long.

102. S. (Diatrype) leioplaca, Fr. S. M. ii. p. 370. Tab. XLVII. fig. 101, sporidia highly magnified. Sporidia biseriate, curved, of a pale yellowish tinge, just like the colour in *S. stigma*, 0·0004 inch long. Very like *Sph. stigma*, only there is no dark-coloured stroma.

103. S. fimeti, Pers., var. equina. Tab. XLVII. fig. 102, ascus with sporidia, and a free sporidium, × 325. Sporidia uniseriate, broadly ovate, sometimes slightly acuminate, sometimes obtuse at the ends, of a deep brown colour, or almost black, quite opaque when ripe, 0·0008 inch long. When immature, the sporidia are pale brown, with large nuclei.

104. S. (Diplodia) Diospyri, Schwein.; Fr. S. M. ii. p. 372. This specimen is not in good condition. I could find no asci, and am doubtful whether or not the sporidia are produced on sterigmata as in *Diplodia*. The sporidia are dark brown, uniseptate, obtuse, slightly constricted in the middle, 0·0006 to 0·0007 inch long.

105. S. velata, Pers.; Fr. S. M. ii. p. 375. Tab. XLV. fig. 104, ascus with sporidia, × 325, and two free sporidia more highly magnified. Sporidia crowded, quite colour-

less, pseudoseptate by division of the endochrome into 2 or 4 partitions, narrowly almond-shaped, 0·0005 inch long.

106. S. (Diatrype) discincola, Schwein.; Fr. S. M. ii. p. 368. Tab. XLVII. fig. 105, sporidia, × 325. Sporidia uniseriate, I think (at least it seemed so from what appeared to be the remnants of the asci), dark opaque brown, almost black, globular or elliptical, 0·0006 inch long.

107. S. (Diatrype) milliaria, Fr. S. M. ii. p. 370. Tab. XLVII. fig. 106, sporidia, × about 450. Sporidia crowded, curved, colourless, 0·0003 inch long. Resembling *S. eutypa* both in habit and fructification; but the ostiola are more prominent, and the perithecia more crowded.

108. S. (Sphæria) limæformis, Schweinitz; Fr. S. M. ii. p. 369. Tab. XLVII. fig. 107, sporidia, × about 450. Sporidia, crowded, colourless when separate, yellowish when the asci are in a mass, curved, usually rounded at the ends, 0·0002 inch long. On oak, very black, very crowded, well-named "limæformis." Fries considers it a form of *Sphæria spinosa*.

109. S. (Sphæria) spinosa, Pers.; Fr. S. M. ii. p. 368. Tab. XLVII. fig. 108, sporidia, × 325. Sporidia yellowish in the mass, almost colourless when single, curved, rounded or acute at the ends, 0·0003 inch long.

110. S. elevata, Berk. Tab. XLVII. fig. 109, asci with sporidia, and free sporidia, × 325. Sporidia numerous, crowded, closely packed, dull yellowish brown in a mass, almost colourless when separate, curved, rounded at the ends, 0·0006 to 0·0007 inch long. From Swan River, Mr. Drummond.

111. S. (Diatrype) lata, Pers.; Fr. S. M. ii. p. 369. Tab. XLVII. fig. 110, sporidia, × 325. Sporidia crowded, yellowish in a mass, almost colourless when single, curved, obtuse at each end, 0·0002 to 0·0004 inch long.

112. S. (Sphæria) spiculosa, Pers.; Fr. S. M. ii. p. 369. Tab. XLVII. fig. 111, sporidia, × 325. Sporidia narrowly almond-shaped, acuminate, quite colourless, with the endochrome divided into four portions, 0·0004 to 0·0005 inch long. Easily known by its black appearance and hair-like ostiola.

113. S. (Valsa) monadelpha, Fr. S. M. ii. p. 382. Fructification not distinguishable from that of *S. stigma*. The contents of the perithecia are glutinous, as in that species.

114. S. (Diatrype or Valsa) æquilinearis, Schwein.; Fr. S. M. ii. p. 374. In this plant the fructification is not distinguishable from that of the last.

115. S. (Sphæria) discutiens, Berk. Engl.; Fr. p. 215. Tab. XLVII. fig. 112, sporidia, × highly. Sporidia biseriate or crowded, 1- 2- or 3-septate, or apparently so from division of the endochrome, colourless, almond-shaped, 0·0005 inch long. Perithecia deeply buried; ostiola long and protruding.

116. Sphæria stipata, Currey; Phil. Trans. 1857. Tab. XLIX. fig. 197, asci with sporidia, × 225. Sporidia biseriate, pale clear brown, very transparent, slightly curved, sometimes with a nucleus at each end, but usually without; 0·0008 to 0·001 inch long. Perithecia ovate, crowded; ostiola sulcate, often exactly resembling those of *S. stellulata*. This plant might be placed either here or in the Confluentes with

almost equal propriety; but the ostiola are somewhat elongated, and the perithecia immersed in the matrix. Eventually, however, the bark is thrown off, and the perithecia form rough, naked, scabrous masses. A dark line often surrounds the masses of perithecia; but the area it includes is very irregular, and the line itself not always present. It might be taken for a coarse abnormal form of *S. stellulata*; but the sporidia are more than double the size of those of *S. stellulata*, and of a different colour. It is very common in this country, principally on elm.

Div. 9. Circumscriptæ.

117. S. (Valsa) enteroleuca, Fr. S. M. ii. p. 381. Tab. XLVII. fig. 113, ascus with sporidia, × 325. Sporidia biseriate, colourless, oblong, acuminate at each end, constricted in the middle, often slightly curved, 4-nucleate, uniseptate (I think, but the septum very difficult to make out), 0·0006 to 0·0007 inch long. On *Robinia Pseudacacia*. Perithecia very numerous in each pustule, deeply imbedded in a very white stroma; when cut across horizontally, a very well-defined black line is seen, which arises from the wood surrounding the perithecia being blackened, thereby causing the appearance of the existence of a conceptaculum; but there is not really any. I have received a plant from Mr. Bloxam marked as *S. enteroleuca*, Fr., of which fig. 114 represents an ascus with sporidia × 325, and free sporidia more highly magnified. The sporidia are very numerous, crowded, brownish yellow in the mass, almost colourless when single, curved, 0·0003 inch long. I suspect, from the habit of the latter plant upon its fruit, that it is a form of *Diatrype aspera*.

118. S. (Valsa) anomia, Fr. S. M. ii. p. 381; El. ii. p. 77. Sporidia (spermatia?) colourless, slightly curved, very minute, about 0·0002 inch long. A very doubtful specimen; but the fruit does not differ very materially from that figured in Sturm's 'Deutschland's Flora.'

119. S. (Valsa) extensa, Fr. S. M. ii. p. 381. Tab. XLVII. fig. 116, ascus with sporidia, × 325. Sporidia uniseriate, colourless, obtuse, slightly constricted in the middle; endochrome bipartite, smooth, and refractive, but doubtless sometimes granular.

120. S. (Valsa) detrusa, Fr. S. M. ii. p. 382. Tab. XLVII. fig. 117, ascus with sporidia, × 325, and a free sporidium, × 450. Sporidia biseriate, colourless; endochrome divided into four, sometimes apparently into only two portions, elliptic, subobtuse or subacuminate at the ends; 0·0006 inch long.

121. S. (Valsa) Pruastri, Pers.; Fr. S. M. ii. p. 380. Sporidia biseriate, almost colourless, but brownish yellow in the mass; minute, curved, 0·0003 inch long. Hardly distinguishable from the fruit of *Diatrype stigma*.

122. S. (Valsa) Carpini, Pers.; Fr. S. M. ii. p. 384. Tab. XLVII. fig. 118, sporidia, × 325. Sporidia curved, colourless, highly refractive, 0·0006 to 0·0008 inch long. There is another specimen in the Herbarium, marked *Sph. Carpini*; but as the sporidia are just like those of *Sph. syngenesia*, it probably belongs to the latter species.

123. S. (Valsa) Syngenesia, Fr. S. M. ii. p. 382. Tab. XLVII. fig. 119, sporidia, ×

325. Sporidia biseriate or crowded, colourless, elliptic-acuminate; endochrome 4-partite, sometimes only 2-partite; 0·0005 to 0·0006 inch long.

124. S. (Valsa) cellulata, Fr. Syst. Myc. ii. p. 380. Tab. XLVII. fig. 120, sporidia, ×450. Sporidia biseriate, very pale yellowish brown, simple, slightly curved, rounded at both ends, 0·0004 inch long.

125. S. (Diplodia?) juglandicola, Schwein.; Fr. S. M. ii. p. 385. Tab. XLVII. fig. 121, fruit, × 325. Sporidia (? stylospores) uniseptate, dark brown, 0·0009 to 0.001 inch long. To the naked eye the plant resembles *S. pulvis-pyrius*.

Div. 10. Incusæ.

126. S. (Valsa) angulata, Fr. S. M. ii. p. 390. Tab. XLVII. fig. 122, ascus with sporidia, and free sporidia, × 225. Sporidia uniseriate, very seldom biseriate, colourless or pale sea-green, obtuse, constricted in the middle, furnished with 4 (? sometimes 5) cilia, one proceeding from each pole and one from the middle of each side; endochrome usually granular; 0·0008 to 0·0012 inch long. The above is the usual form of the sporidia; but sometimes, when the endochrome is oleaginous and not granular, the appearance of the sporidia is so different that they might almost be taken for a second form of fruit. A second form of fruit does exist in this species, as to which I would refer to my paper "On the Fructification of certain Sphæriaceous Fungi," read before the Royal Society, in June 1857. See Phil. Trans. 1857.

127. S. (Valsa) melasperma, Fr. S. M. ii. p. 389. Tab. XLVII. fig. 123, ascus with sporidia, and free sporidia, × 325. Sporidia very numerous, slightly curved, of a pale-yellowish tinge, 0·0002 to 0·0003 inch long.

128. S. (Valsa) taleola, Fr. S. M. ii. p. 390. Tab. XLVII. fig. 124, ascus with sporidia, and free sporidia, × 450. Sporidia biseriate, colourless or very pale green, elongate-acuminate, frequently or usually slightly curved, 0·0007 to 0·0008 inch long. I think there is no real septum. I find not the slightest difference between the sporidia of *Sphæria taleola* and those of *S. leiphæmia*, and have little doubt that the two plants are not distinct. I feel sure that the conceptaculum which is said to distinguish *S. taleola* is a characteristic not to be relied upon; for there are some species of *Sphæria* which sometimes have a conceptaculum and sometimes not. The plants marked *S. taleola* at Kew have no conceptaculum; and I have seen other specimens marked *S. taleola* also without a conceptaculum.

129. S. (Valsa) fulvo-pruinata, Berk. Tab. XLVII. fig. 125, asci with sporidia, ×325. Sporidia uniseriate, sometimes slightly acuminate at each end, but sometimes obtuse at the ends, slightly constricted in the middle, uniseptate, dark brown, paler at first (and then an inner membrane and sometimes nuclei are visible), 0·0006 to 0·0007 inch long. Easily recognized by the tawny colour of the protruded bark surrounding the ostiola.

130. S. (Valsa) nivea, Hoffm.; Fr. S. M. ii. p. 386. Tab. XLVII. fig. 126, asci with sporidia, and free sporidia, × 325. Asci crowded with sporidia; sporidia colourless, slightly curved, 0·0002 to 0·0003 inch long.

131. S. (Valsa) foraminula, Pers. in litt. Tab. XLVII. fig. 127, ascus with sporidia, and

free sporidia, × 325. Sporidia biseriate, elliptical, sometimes acuminate, sometimes obtuse at the ends, colourless, 0·0011 to 0·0016 inch long. In some sporidia the endochrome was broken up into two, three, or six portions, but, I think, only from being dry.

132. S. (Valsa) profusa, Fr. S. M. ii. p. 392. Tab. XLVII. fig. 128, sporidia, × 450: *a*, a young sporidium almost colourless or very slightly greenish; *b*, a sporidium more advanced; *c*, a ripe sporidium. The sporidia when young have a gelatinous envelope, which disappears in age, the asci frequently containing only four sporidia arranged in one continuous series; I believe, however, the normal number to be eight, and that they are sometimes arranged biseriately. The asci are absorbed at a very early period, so that usually only free sporidia are to be found. These when ripe are of a clear rich olive-brown colour with a very slight greenish tinge, oblong-elliptic, 0·001 to 0·002 inch long. One of the most beautiful *Sphæriæ* in point of fructification.

133. S. (Diplodia?) rudis, Fr. El. ii. p. 98. Tab. XLVII. fig. 129, fruit, × 325. No asci; sporidia (? stylospores) rather dark brown, broadly elliptical, but slightly constricted in the middle, 0·0010 to 0·0011 inch long.

134. S. (Valsa) microstoma, Pers.; Fr. S. M. ii. p. 388. Tab. XLVII. fig. 130, ascus with sporidia, and free sporidia, × 325. Sporidia biseriate, colourless, transparent, curved, obtuse at the ends, 0·0005 to 0·0007 inch long.

135. S. (Valsa) dissepta, Fr. S. M. ii. p. 392. Tab. XLVIII. fig. 131, asci with sporidia, and free sporidia, × 325. Sporidia biseriate, colourless, linear-acuminate or almond-shaped; endochrome bi- or quadripartite; 0·0004 to 0·0005 inch long.

136. S. (Valsa) circumscripta, Fr.; Mont. Syll. p. 220, under "Valsa." Tab. XLVIII. fig. 132, sporidia, × 325. Sporidia biseriate, colourless, linear, pointed at the ends; endochrome bipartite, sometimes quadripartite; 0·0006 inch long. This agrees with Montagne's description, except that he calls the sporidia obtuse.

137. S. (Valsa) Kunzei, Fr. S. M. ii. p. 388. Tab. XLVIII. fig. 133, ascus with sporidia, and free sporidia, × 325. Sporidia biseriate, brownish yellow in the mass, almost colourless when single, curved, 0·0004 inch long. Described from a specimen of Mr. Berkeley's, that at Kew having no fruit.

138. S. (Valsa) concamerata, n. s. Tab. XLVIII. fig. 134, ascus with sporidia, × 325. Sporidia crowded, colourless, curved, 0·0004 inch long; perithecia raising the inner bark into a dome-shaped conceptaculum, nests of perithecia united by white woolly fibres. On oak; *quære*, a form of *S. ceratosperma*?

139. S. cincta, n. s. Tab. XLVIII. fig. 185, ascus with sporidia, × 325. Sporidia uniseriate, dark rich brown, obtuse, constricted in the middle, 0·0007 inch long, uniseptate; perithecia irregularly ovate, closely packed in a compact leathery conceptaculum; ostiola bursting through the bark and forming round dark pustules: under a lens the ostiola seem surrounded with a dirty-olive-green stroma. Blackheath Park, March 1855.

140. S. (Valsa) Sorbi, Schmidt; Fr. S. M. ii. p. 380. Sporidia not distinguishable from those of *S. stigma*.

141. S. (Valsa) sacculus, Schwein.; Fr. S. M. ii. p. 378. In the sphæropsoid state, spermatia colourless, delicate, slightly curved, obtuse or subobtuse at the ends, 0·0002 to 0·0003 inch long.

142. S. enteroxantha, Berk. Fructification exactly similar to that of *S. stigma*, as well in the glutinous nature of the contents of the perithecia as in the size, shape, and colour of the asci and sporidia. From British Guiana.

143. S. (Valsa) Cratægi, n. s. Tab. XLVIII. fig. 135 *a*, sporidia, × 425. Sporidia biseriate, oblong or elliptical, sometimes curved; endochrome 4-, sometimes 2-partite, colourless, 0·0006 to 0·0010 inch long; perithecia irregularly globose; ostiola rather short. Very common on thorn near Blackheath and elsewhere.

144. S. (Valsa) dryina, n. s. Tab. XLVIII. fig. 135 *b*, ascus with sporidia, and free sporidia, ×325. Sporidia biseriate or crowded, colourless, strongly curved; both asci and sporidia very delicate and hyaline; 0·0003 inch long. On dead oak-branches at Weybridge. Perithecia pyriform, imbedded in a dirty-brown stroma; ostiola rather shorter than the body of the perithecia, and somewhat thickened towards the apex.

Div. 11. Obvallatæ.

145. S. (Valsa) coronata, Hoffm.; Fr. S. M. ii. p. 395. Tab. XLVIII. fig. 136, ascus with sporidia, × 325. Sporidia colourless, biseriate, elliptic-acuminate, constricted in the middle, 0·0007 to 0·0008 inch long.

146. S. (Valsa) leiphæmia, Fr. Syst. Myc. ii. p. 399. Tab. XLVIII. fig. 137, sporidia, × 450. Sporidia biseriate, colourless or pale green, elongate-acuminate, slightly curved; endochrome refractive or granular, consisting of two distinct portions with a clear space (not, I think, a septum) between them; the outer membrane is so delicate that it is frequently not visible. I have found specimens in which the sporidia have oozed out of the perithecia and formed round rose-coloured tubercles at the apices of the ostiola, looking like *Tubercularia vulgaris* (see remarks under *S. taleola*). Length of sporidia about 0·0007 inch.

147. S. (Valsa) ambiens, Pers. Syn. p. 44.; Fr. S. M. ii. p. 403. Tab. XLVIII. figs. 138, 138 *a*, asci with sporidia, and free sporidia, × 325. Sporidia colourless, crowded, curved, rounded at each end, 0·0006 inch long.

148. S. (Valsa) turgida, Pers.; Fr. S. M. ii. p. 400. Tab. XLVIII. fig. 139, ascus with sporidia, and free sporidia, × 325. Sporidia uniseriate, at first a pale clear greenish brown with two or more nuclei, eventually a very dark opaque brown without (or with hardly visible) nuclei, elliptical, subacuminate, 0·0003 to 0·0004 inch long.

149. S. (Valsa) stilbostoma, Fr. S. M. ii. p. 403. Tab. XLVIII. fig. 140, ascus with sporidia, and free sporidia, × 325. Sporidia biseriate, colourless, acuminate-elliptic but constricted in the middle; the endochrome divided into two portions (not, I think, septate), sometimes smooth, glossy, and highly refractive, sometimes granular; 0·0007 inch long. The variety *Platanoides* (see fig. 140 *a*) has triseptate or pseudo-triseptate sporidia, which are 0·0010 to 0·0011 inch long, and sometimes mucronate.

150. S. (Valsa) querna, n. s. Tab. XLVIII. fig. 141, ascus with sporidia, × 325. Sporidia slightly curved, simple, linear, colourless, subhyaline, crowded at the apex of the ascus as in many *Peziza*, 0·0002 to 0·0003 inch long. Weybridge, 1856. Not in a sufficiently good condition to describe the perithecia accurately. The fruit differs from that of any of the allied species with which I am acquainted.

151. S. (Valsa) biconica, n. s. Weybridge, January 7, 1856. Tab. XLVIII. fig. 142, ascus with sporidia, and free sporidia, × 220. Sporidia biconical; endochrome granular or oleaginous, greenish; 0·0011 to 0·0012 inch long; perithecia globose or depressed, few together, arranged in circles, penetrating the bark with their rather short ostiola and forming small pustules.

152. S. (Valsa) pulchra, n. s. Tab. XLVIII. fig. 143, ascus with sporidia, × 225. Sporidia biseriate, elliptical but slightly constricted in the middle and slightly acuminate at each end, uniseptate, greenish; perithecia imperfect.

153. S. (Valsa) suffusa, Fr. S. M. ii. p. 399. Tab. XLVIII. fig. 144, sporidia, × 225. Sporidia variously curved from their great length, colourless, granular, biseriate or crowded.

154. S. (Valsa) Juglandis, Schwein., non Fries. Tab. XLVIII. fig. 145, sporidia, × 450. Sporidia biseriate, yellowish, as in *S. stigma*, 0·0003 to 0·0004 inch long.

155. S. (Valsa) Abietis, Fr. S. M. ii. p. 398. Tab. XLVIII. fig. 147, ascus with sporidia, and free sporidia, × 325. Sporidia biseriate, colourless, curved, 0·0003 to 0·0006 inch long. This I believe to be the true *S. Abietis* of Fries. Fig. 146 represents the fruit of a *Sphæria* also occurring on Fir and resembling *S. Abietis* in general appearance. The sporidia in this latter plant are biseriate, colourless, subhyaline, curved, acuminate at each end, 1-septate or pseudo-septate, 0·0007 inch long. It is possible that the species may not be really different from *S. Abietis*, and that the latter may, in its perfect state, have septate sporidia. There are, as stated above, several *Sphæriæ* in which the normal state of the fruit is septate, but in which that state is often not attained.

156. S. (Valsa) tetraspora, n. s. Weybridge, January 1856. Tab. XLVIII. fig. 148, ascus with sporidia, and free sporidia, × 325. Sporidia simple, slightly curved, rounded at each end, colourless, *only 4 in each ascus*, biseriate, 0·0008 inch long; perithecia globose; ostiola surrounding or scattered through a white disk. The plant hardly differs from *S. ambiens*, except in its tetrasporous fructification.

157. S. (Valsa) salicina, Pers.; Fr. S. M. ii. p. 401. Tab. XLVIII. fig. 149, ascus with sporidia, and free sporidia, × 325. Sporidia biseriate, colourless, uniseptate, with granules and small nuclei, the septum often very difficult to make out, elliptical, but usually slightly curved, and often slightly constricted in the middle, 0·0009 inch long.

158. S. (? Valsa) intexta, n. s. Tab. XLVIII. fig. 169, ascus with sporidia, × 325. Sporidia interwoven, generally nearly as long as the ascus, filiform and flexuous. This plant was not in a state to enable me to describe the perithecia. It appears to belong to the Circinatæ, and occurred on oak at Weybridge. The paraphyses were very long and numerous, and septate. I know of no species to which it can be referred, although the sporidia somewhat resemble those of *S. suffusa*, Fr.

Div. 12. Circinatæ.

159. S. (Valsa) pulchella, Pers.; Fr. S. M. ii. p. 406. Tab. XLVIII. figs. 150–153, asci with sporidia, and (in fig. 152) free sporidia, × 325. Sporidia biseriate or crowded, colourless, slightly curved or nearly straight; normally uniseptate, but the septum sometimes not distinguishable; varying much in size, 0·0005 inch in length being about the average. The sporidia are sometimes rounded at the ends, sometimes slightly acuminate.

160. S. (Valsa) furfuracea, Fr. S. M. ii. p. 409. Tab. XLVIII. fig. 154, sporidia, × 450. Sporidia colourless or pale green, uniseriate, 0·0008 inch long.

161. S. (Valsa) convergens, Tode; Fr. S. M. ii. p. 410. Tab. XLVIII. fig. 155, fruit, × 325. Sporidia dark brown, subcymbiform but irregular in shape, frequently constricted in the middle; length variable. On *Platanus occidentalis*, the perithecia being under the bark so as not to be seen above, except by the undulations of the bark. I found that some of the perithecia produced, in lieu of the regular sporidia, numbers of the small diplodioid bodies shown in the figure, below the sporidia. One of the sporidia has commenced germination.

162. S. (Valsa) hypodermia, Fr. S. M. ii. p. 407. Tab. XLVIII. fig. 156, asci with sporidia, × 325. Sporidia colourless, granular, narrowly oblong, obtuse or slightly acuminate at each end, sometimes with two or more large globose nuclei, biseriate.

163. S. (Valsa) thelebola, Fr. S. M. ii. p. 408. Tab. XLVIII. figs. 157, 158, and 159, asci with sporidia, and free sporidia, × 325. Sporidia biseriate, greenish or colourless, slightly arcuate, obtuse at both ends; usually with a cilium at each end, which is not visible whilst the sporidia are in the ascus. These cilia require care, to be rendered visible even when the sporidia are detached; they are sometimes absent. Length of the sporidia and size of the asci variable, the sporidia sometimes reaching 0·0017 inch. These figures show in a marked manner the difference in the appearance of the sporidia when the endochrome is oleaginous and refractive, and when it is granular.

164. S. (Valsa) xanthostroma (or chrysostroma), Mont. Sylloge, p. 221. Tab. XLVIII. fig. 160, ascus with sporidia, and free sporidia, × 350. Sporidia uniseriate or biseriate, more often the former, colourless or greenish, almond-shaped, pseudo-septate from the division of the endochrome, 0·0007 inch long. Perithecia small, hardly visible above the bark, but (like all the Circinatæ) very visible when the epidermis is stripped off. Easily known by its yellow stroma. Endochrome smooth and refractive. In another specimen of the same species I found the sporidia not septate, and reaching nearly 0·0009 inch in length.

165. S. (Valsa) vestita, Fr. S. M. ii. p. 410. Tab. XLVIII. fig. 161, ascus with sporidia, × 425. Sporidia clear brown, multicellular, having transverse, longitudinal, and oblique septa, 0·0006 to 0·0009 inch long. As to the fructification of this species, see my paper in the 'Phil. Trans.' 1857, above referred to.

166. S. (Diplodia?) Meliæ, Fr. El. ii. p. 85. Tab. XLVIII. fig. 162, sporidia, × 325. Sporidia clear dark brown, some margined, some (not many) with a central nucleus,

elliptic, rather irregular, varying much in length, the average being about 0·0008 inch. I could find no asci.

167. S. (Valsa), ? sp. Tab. XLVIII. fig. 163, ascus with sporidia, × 225. This plant is one of the "*Fungi Pyrenæi*," and is marked "*S. cohærens, Pers.*" in that collection. It has, however, no affinity with *S. cohærens*, but belongs to the Circinatæ. The fruit differs from that of all other species of the division Circinatæ with which I am acquainted. The sporidia are uniseriate, of a rich brown colour, obtusely elliptical, uniseptate, 0·0014 inch long.

168. S. (Valsa) quaternata, Pers. Syn. p. 45. Tab. XLVIII. figs. 164 and 165, asci with sporidia, and free sporidia. In fig. 164, *a* is × 220, *b* about 325 diameters. Fig. 165 is × 450. Sporidia biseriate, almost colourless when separate, but in a mass of dull-brownish yellow, like the colour in *S. stigma*, *S. stellulata*, &c., curved, 0·0004 to 0·0006 inch long.

169. S. (Valsa) Innesii, n. s. Tab. XLVIII. fig. 166, sporidia, × 325. Sporidia biseriate, colourless, acute at each end, and constricted three times; endochrome 4-partite; 0·0010 to 0·0012 inch long. Sporidia frequently, if not always, with a delicate appendage at each end. Perithecia irregularly globose; ostiola elongated and frequently thickened at the apex. Externally much resembling *S. pulchella*, but smaller and differing altogether in fructification from that species.

170. S. (Valsa) arcuata, n. s. Tab. XLVIII. fig. 167, asci with sporidia, and free sporidia, × 325. Perithecia globose, arranged in circles; ostiola penetrating the bark and forming a dark-coloured, sometimes dirty-white disk. Sporidia biseriate, pale green, 4–5-septate, very flexible, sometimes constricted at the articulations, sometimes not, variable in length, somewhat resembling *S. quercina*, Pers. in its sporidia; but *S. quercina* belongs to the Versatiles, and this plant to the Circinatæ.

171. S. (Valsa) faginea, n. s. Eltham Grove, October 1856. Tab. XLVIII. fig. 168, sporidia, × 420. Sporidia biseriate, colourless, elliptic-acuminate, but constricted in the middle, and irregular, 0·0005 inch long. Perithecia conical; ostiola penetrating the bark, normally long and protruding, but mostly broken off; when the long ostiola are rubbed off, the plant looks just like *S. quaternata* or *S. turgida*. On beech.

Div. 13. Cæspitosæ.

172. Sphæria cupularis, Pers.; Fr. S. M. ii. p. 416. Tab. XLVIII. fig. 170, asci with sporidia, and free sporidia, × 325. Sporidia biseriate, colourless, curved, 0·0004 inch long, sometimes rather longer.

173. S. Pseudo-bombarda, Mont. Sylloge, p. 228. Tab. XLVIII. fig. 171, ascus with sporidia, and free sporidia, × 225. Sporidia biseriate or crowded, colourless, irregular, 0·002 inch long. This plant was in a young state; the spores when ripe are described by Dr. Montagne as 6-septate and "olivaceo-fuliginosas."

174. S. (Nectria) examinans, Berk. Tab. XLIX. fig. 172, ascus with sporidia, and free sporidia, × 325. Sporidia uniseriate or biseriate, clear dark brown, elliptical, subacuminate, 0·0008 inch long. Perithecia forming long black lines. The contents of the sporidia were mostly clear, sometimes multinucleate, and sometimes granular.

175. S. (Nectria) coccinea, Pers.; Fr. S. M. ii. p. 412. Tab. XLIX. figs. 174 and 175, ascus with sporidia, and free sporidia, × 325. Sporidia almost always uniseriate, colourless, uniseptate, frequently with a nucleus in each septum, elliptical, subacuminate, 0·0005 inch long. In the variety "*sanguinella*" I did not find any difference in the fruit, except that the average size of the sporidia was somewhat smaller. Fig. 175 represents free sporidia of the variety "*cicatricum*," Desm., × 450.

176. S. (Nectria) cinnabarina, Tode; Berk. Engl. Flora, No. 77, under "Sphæria." Tab. XLIX. fig. 175, sporidia, × 450. Sporidia sometimes uniseriate, sometimes biseriate, normally I believe uniseptate, frequently if not always constricted in the middle, rather pointed at each end, colourless or pale sea-green, 0·0004 to 0·0006 inch long. I found some sporidia attached to long threads; but whether they were in the nature of stylospores, or whether the threads were the product of germination, I cannot say. Several of the sporidia were biseptate. See *a*, fig. 175.

177. S. (Nectria) decolorans, Pers. Syn. p. 49. Tab. XLIX. fig. 176, ascus with sporidia, and free sporidia, × 325. Sporidia uniseptate, colourless or greenish, 0·0005 inch long. Placed by Fries under *S. cinnabarina*, from which it differs in its more compact habit and in the more broadly elliptical sporidia; the perithecia, however, are rugged as in that species, with which perhaps it ought to be united.

178. S. Berberidis, Pers.; Fr. S. M. ii. p. 415. Tab. XLIX. fig. 177, sporidia, × 325. Sporidia uniseriate, but so overlapping as to be almost biseriate, yellow when young, brown when mature, constricted in the middle, usually acuminate at the ends, 0·0011 to 0·0016 inch long. Quære if distinct from *S. Laburni*?

179. S. (Nectria) cucurbitula, Tode; Fr. S. M. ii. p. 415. Tab. XLIX. fig. 178 *a*, sporidia; *b*, spermatia; and *c*, caudate irregular bodies: all × 325. Sporidia colourless, irregularly elliptical, 0·0004 inch long. Two membranes very visible in the sporidia. Besides the normal asci and sporidia, the perithecia produce asci containing the spermatia-like bodies (*b*) on the right: and the caudate bodies on the left also appeared to proceed from the same perithecia; but of this I am doubtful. The length of the spermatia is 0·0001 to 0·0002 inch, of the caudate bodies 0·0006 inch; what the latter may be I cannot say.

180. S. Laburni, Pers. Syn. p. 50. Tab. XLIX. fig. 179, ascus, × 225, and free sporidia, × 450. Sporidia, when perfect, multicellular, dark clear brown. I find in different perithecia in the same stroma every gradation from colourless minute unicellular spores (mostly with a nucleus at each end), through septate, biseptate, and triseptate forms, up to the multicellular. The colour varies by degrees, being at first colourless, then green, and eventually dark clear brown.

181. S. pulicaris, Fr. S. M. ii. p. 417. Tab. XLIX. fig. 180, ascus with sporidia, and free sporidia, × 325. Sporidia biseriate, colourless, elliptical, sometimes pyriform, pseudo-triseptate from division of the endochrome, 0·0006 to 0·001 inch long.

182. S. (Nectria) Purtoni, Grev. Tab. XLIX. fig. 181, ascus with sporidia, × 325. Sporidia uniseriate, colourless, acuminate, elliptical, 0·0004 inch long. Fries joins this species with *S. Abietis*; I do not know why, as it is quite distinct in habit and fructification.

183. S. (Nectria) acervalis, Moug.; Fr. El. ii. p. 83. Tab. XLIX. fig. 182, ascus with sporidia, × 325. Sporidia uniseriate, rarely biseriate, colourless, elliptical, uniseptate or pseudo-uniseptate, 0·0005 inch long.

184. S. (Nectria) Aquifolii, Fr. El. ii. p. 82. Tab. XLIX. fig. 183, ascus with sporidia, and free sporidia, × 325. Sporidia uniseriate, colourless, elliptical, pseudo-uniseptate by division of the endochrome, which is oleaginous or granular; 0·0005 inch long.

185. Sphæria acervata, Fr. S. M. ii. p. 416. Tab. XLIX. figs. 184, 185, ascus with sporidia, and free sporidia, × 325. Sporidia biseriate, colourless, hyaline, curved, 0·0003 to 0·0005 inch long. Very like (? different from) *S. cupularis*. Mr. Bloxam informs me that he has sometimes found the sporidia elliptical, uniseptate, or with several nuclei.

186. Sphæria conglobata, Fr. The Hookerian herbarium contains several plants marked *S. conglobata*, Fr.; but they are all specimens of *S. pulvis-pyrius*, some being subcuticular, some bursting transversely, some longitudinally, others forming a cæspitose mass, others in the usual scattered condition. They form a very instructive series of specimens, showing the Protean habit of *S. pulvis-pyrius*. The specimen of *S. dioica*, Fr., at Kew, is also a subcuticular form of *S. pulvis-pyrius*, a form by no means uncommon in this country.

187. S. Buxi. Milton, Northamptonshire, *Berkeley*. Tab. XLIX. fig. 186, ascus with sporidia, highly magnified. Sporidia uniseriate, ? colourless, acuminate, elliptical, 0·0005 inch long. Perithecia light yellow, rather longer than broad, with a small mamillate ostiolum. I doubt if the sporidia are not sometimes uniseptate. The fruit was hardly ripe, although a good many sporidia were visible.

Div. 14. Confluentes.

188. Sphæria scoriadea, Fr. El. ii. p. 87. Tab. XLIX. fig. 187, sporidia, × 325. Sporidia reddish brown, opaque, lageniform, when young with a gelatinous envelope. The tips of the sporidia are paler than the body; they are irregular in length and breadth, varying from 0·0016 to 0·0028 inch in length. There is some doubt whether this plant be not a *Verrucaria*. See Annals of Nat. Hist. vol. vi. p. 360, and Leighton's 'British Angiocarpous Lichens,' p. 39, under "*Verrucaria conferta*, Tayl."

189. Sphæria rhizogena, Berk. Tab. XLIX. fig. 190, ascus with sporidia, × 325. Sporidia uniseriate, rarely biseriate, colourless or greenish, probably brown when ripe; elliptical, sometimes slightly constricted in the middle, uniseptate or biseptate or (?) sometimes cellular, 0·0005 to 0·0006 inch long. On the roots of *Gleditschia triacanthos*, washed bare by the Ohio freshets. Perithecia seated on or immersed in a ferruginous woody or leathery stroma, producing, when young, very minute subcylindrical spermatia.

190. Sphæria Spartii, Nees; Fr. S. M. ii. p. 424. Tab. XLIX. fig. 189, ascus with sporidia, × 325. Sporidia uniseriate, frequently (if not usually) slightly overlapping, dark brown, cellular, acuminate, constricted in the middle, 0·0011 to 0·0012 inch long. This species = *S. elongata*, Fr.

191. Sphæria ? Dothidea, Fr. (? Mont.), S. M. ii. p. 423. Tab. XLIX. fig. 190, ascus

with sporidia, × 325. Sporidia crowded, colourless, broadly almond-shaped, 0·0007 to 0·0009 inch long.

192. Sphæria mutila, Fr. S. M. ii. p. 424. Tab. XLIX. fig. 191, sporidia, × 325. Sporidia crowded, colourless, but with a greenish tinge; endochrome divided transversely, and frequently also longitudinally; sporidia irregular in shape, variable, 0·0008 to 0·0012 inch in length.

193. Sphæria megalospora, Mont. Sylloge, p. 229. Tab. XLIX. fig. 192, ascus with sporidia, × 225. Sporidia uniseriate, rich dark brown, obtusely elliptical, constricted in the middle, frequently slightly curved, 0·0016 inch long.

194. Sphæria insidens, Schw.? Tab. XLIX. fig. 193, sporidia highly magnified. I could find no asci. Sporidia pale clear brown, irregularly elliptical or subturbinate, 0·0003 inch long, or rather less; on rough corky elm-bark, blackening the furrows with its small perithecia.

195. Sphæria melogramma, Pers.; Fr. S. M. ii. p. 420. Tab. XLIX. fig. 194, sporidia, × 450. Sporidia biseriate, arcuate, acuminate at both ends, triseptate, pale greenish brown, probably ultimately clear dark brown, 0·0014 to 0·002 inch long.

196. Sphæria Calycanthi, Fr. (sed qu. Schwein.), S. M. ii. p. 421. Tab. XLIX. fig. 195, ascus with sporidia, × 325. Sporidia crowded, colourless, hyaline, with one or many nuclei, or none; broadly almond-shaped, 0·0008 to 0·0011 inch long.

197. S. (Diatrype) decipiens, Dec.; Fr. S. M. ii. p. 371. Tab. XLIX. fig. 196, sporidia highly magnified. I could find no asci. Sporidia elliptical, varying much in length and breadth, sometimes slightly curved, rather dark brown, 0·0003 inch long, crowded. Ostiola stellate, just as in *S. stellulata*.

198. S. (Diplodia) subsolitaria, Schwein.; Fr. El. ii. p. 86. Tab. XLIX. fig. 198, sporidia, × 325. This plant might be placed in the genus *Diplodia*, the sporidia being borne on sterigmata, not produced in asci. Sporidia of a clear brown colour, irregularly elliptical or subpyriform, pseudo-uniseptate from the division of the endochrome.

198 *a*. Sphæria chrysentera, n. s. Perithecia rounded, without any neck, crowded, situated underneath the outer bark, which is thrown off sometimes irregularly, sometimes in rings. Contents of the perithecia yellow. Sporidia biseriate, bright yellow when young, then a pale clear light brown, eventually darker brown; irregular in shape, usually somewhat acuminate at each end, always constricted in the middle, the outline sometimes wavy, not (I think) septate, although the endochrome is always divided into two distinct portions, frequently into four, and occasionally into three. Length of sporidia, 0·0008 to 0·0009 inch. Weybridge, September 1856. Easily known by the bright yellow colour of the contents of the perithecia, and by its peculiar fruit. The perithecia are sometimes seated on a byssoid subiculum, which made me doubt to which division it should be referred.

Div. 15. Seriatæ.

199. S. Junci, Fr. Tab. XLIX. fig. 199, sporidia, × 325. Sporidia biseriate, yellowish-brown, linear-acuminate, 3-septate, 0·0012 inch long, hardly distinguishable from the

fruit of *S. arundinacea*. *S. Junci* is placed, in the 'Summa Veg. Sc.,' after *Dothidea*, with the remark "Incerti generis, priori affinis."

200. Sphæria arundinacea, Sow. Tab. XLIX. fig. 200, sporidia, × 325. Sporidia biseriate, yellowish-brown, linear, acuminate at one or both ends, 3–5-septate, 0·0010 to 0·0016 inch long.

201. Sphæria nebulosa, Pers.; Fr. S. M. ii. p. 430. Tab. XLIX. fig. 201, ascus with sporidia, × 325. Sporidia biseriate, colourless, subacuminate, straight or slightly curved, uniseptate, 0·0003 to 0·0005 inch long.

202. Sphæria Godini, Desm. Tab. XLIX. fig. 202, ascus with sporidia, × 325. Sporidia biseriate, linear-acuminate, uniseptate, colourless, 0·0010 to 0·0012 inch long. Messrs. Berkeley and Broome state (Ann. Nat. Hist. s. 2. vol. vii. p. 137) that this species is identical with *S. arundinacea*, Sow.; but in the Kew specimens the species differ in the colour of the sporidia, and in the number of the septa. This, however, would not prove them distinct, as the number of septa varies in many species, and sporidia which are colourless when young frequently become brown in age.

203. Sphæria clara, n. s. Tab. XLIX. fig. 203, ascus with sporidia, × 325. Sporidia biseriate, colourless, subfusiform, 4-nucleate, sometimes also with some smaller nuclei; slightly constricted in the middle, 0·0010 to 0·0012 inch long. On some reed. This fruit is described from a specimen which I had in my own herbarium, but which I have mislaid. The species is not in the Hookerian herbarium.

204. S. pardalota, Mont. This plant produced only colourless, rather narrowly elliptical stylospores 0·0002 to 0·0004 inch long. The true sporidia are described as cymbiform and biseptate. See Mont. Syll. p. 235.

205. Sphæria? pantherina, Berk. The specimen of this plant produced no asci, but fusiform stylospores 0·0008 to 0·001 inch long, and extremely narrow.

206. Sphæria longissima, Pers. This species forms long dark spots studded with the perithecia. The specimens at Kew are imperfect; but in two of the perithecia I observed elliptical or slightly curved bodies with two nuclei, and sometimes with a septum in the middle, greenish or yellowish in colour, 0·0004 to 0·0006 inch long and about half as wide; but whether true fruit or not, I cannot say. I have seen no other specimens.

Div. 16. Confertæ.

207. Sphæria bifrons, Schm. and Kunze; Fr. S. M. ii. p. 438. Tab. XLIX. fig. 204, ascus with sporidia, and free sporidia, × 325. Sporidia biseriate, colourless, curved, 0·0005 inch long.

207 *a*. Sphæria graminis, Pers.; Fr. S. M. ii. p. 434. Tab. XLIX. fig. 211, asci with sporidia, and free sporidia, × 450. Sporidia colourless, broadly elliptical, frequently with a single large globose nucleus.

208. S. (Diplodia?) Malorum, Berk. Engl. Flora, vol. v., "Fungi," p. 257. Tab. XLIX. fig. 205, stylospores, × 325. Stylospores greenish, margined; contents granular; 0·0012 inch long.

209. S. gigantea, Mont. Syll. 230. Tab. XLIX. figs. 206 and 207, ascus with sporidia,

and free sporidia, × 325. Sporidia usually biseriate, but sometimes uniseriate, dar brown, multiseptate (always, I think, 7-septate), and also divided longitudinally i. each division except the two end ones; curved, cymbiform, surrounded by a gelatinous envelope not perceptible in the ascus, at least in the Kew specimens; 0·0018 inch long. On *Agave*. A large, black, subhemispherical mass ½ inch and more wide. The fruit is very striking.

210. S. (Hendersonia?) Yuccæ-gloriosæ, Schwein.; Fr. S. M. ii. p. 437. Tab. XLIX. fig. 208, stylospores, × 350. Stylospores colourless, linear, 0·0010 to 0·0018 inch long. Not a true *Sphæria*, or, if so, only in a secondary state of fructification.

211. Sphæria rhytismoides, Bab. in Proc. Linn. Soc. vol. i. p. 32. Tab. XLIX. fig. 209, ascus with sporidia, × 325. Sporidia crowded, colourless, hyaline, obtuse, 0·0005 inch long.

212. S. (Diatrype?) insularis, Berk. MSS. Tab. XLIX. fig. 210, ascus with sporidia, and free sporidia, × 325. Sporidia biseriate, colourless; narrowly almond-shaped, or flat on one side; 0·0005 inch long. Placed in the Herbarium with the Confertæ, but belonging, I think, to the Lignosæ. The black line is very distinct. On *Aucuba Japonica*. The endochrome is sometimes 1-, 2-, or 4-partite. It is, I think, very common on *Aucuba Japonica*, but has not, as far as I am aware, been described, unless, as Mr. Berkeley has suggested to me, it may be *S. controversa*, Desm.

213. Sphæria fimbriata, Pers. Syn. p. 36; Fr. S. M. ii. p. 436. The sporidia are, I believe, colourless and curved, similar to those of *Valsa ambiens*. Fig. 212 represents asci and sporidia, × 225; but the specimens are not quite ripe.

214. Sphæria ceuthocarpa, Fr. S. M. ii. p. 439. Tab. XLIX. fig. 213, ascus with sporidia, and a free sporidium, × 425. Sporidia lying side by side, extending in length all along the ascus, colourless, divided by numerous septa, which are not always visible except under a high power.

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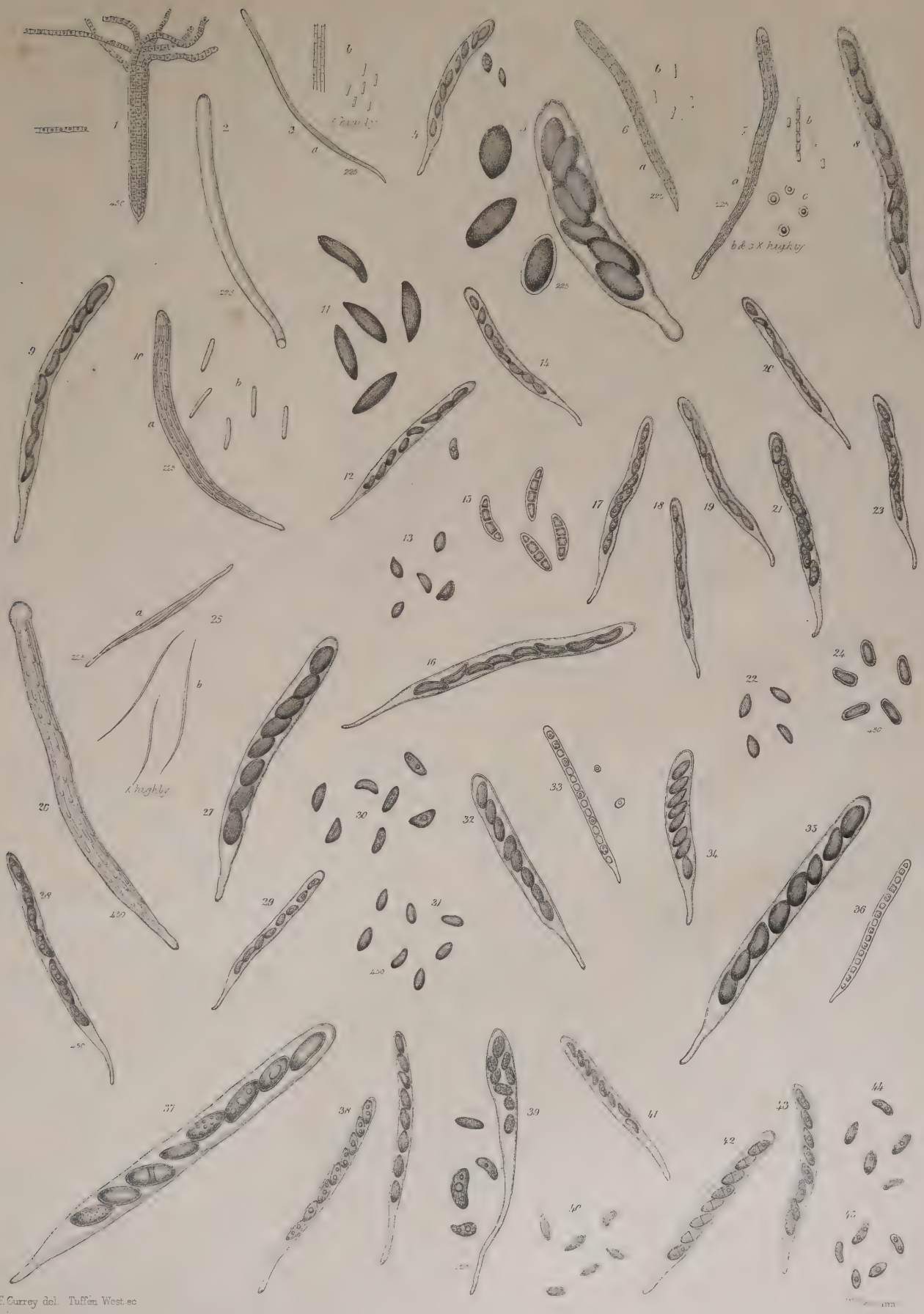
GEN. SPHÆRIA.

(Figs. 1 to 45)

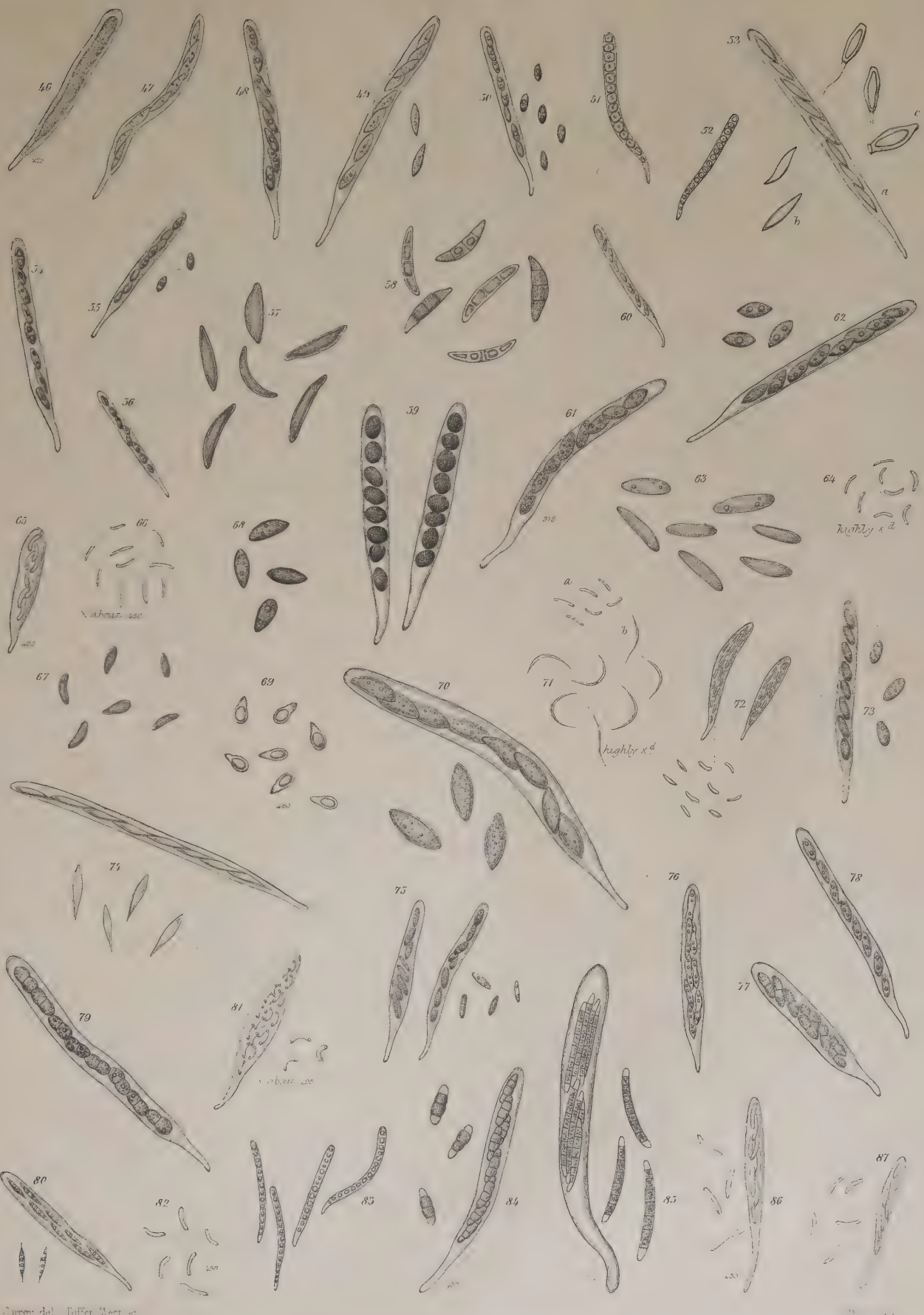


F. Currey del. Tuffen West sc

All the figures magnified 325 Diameters, except where otherwise stated.

GEN. SPILERIA

(Figs 46 to 87)



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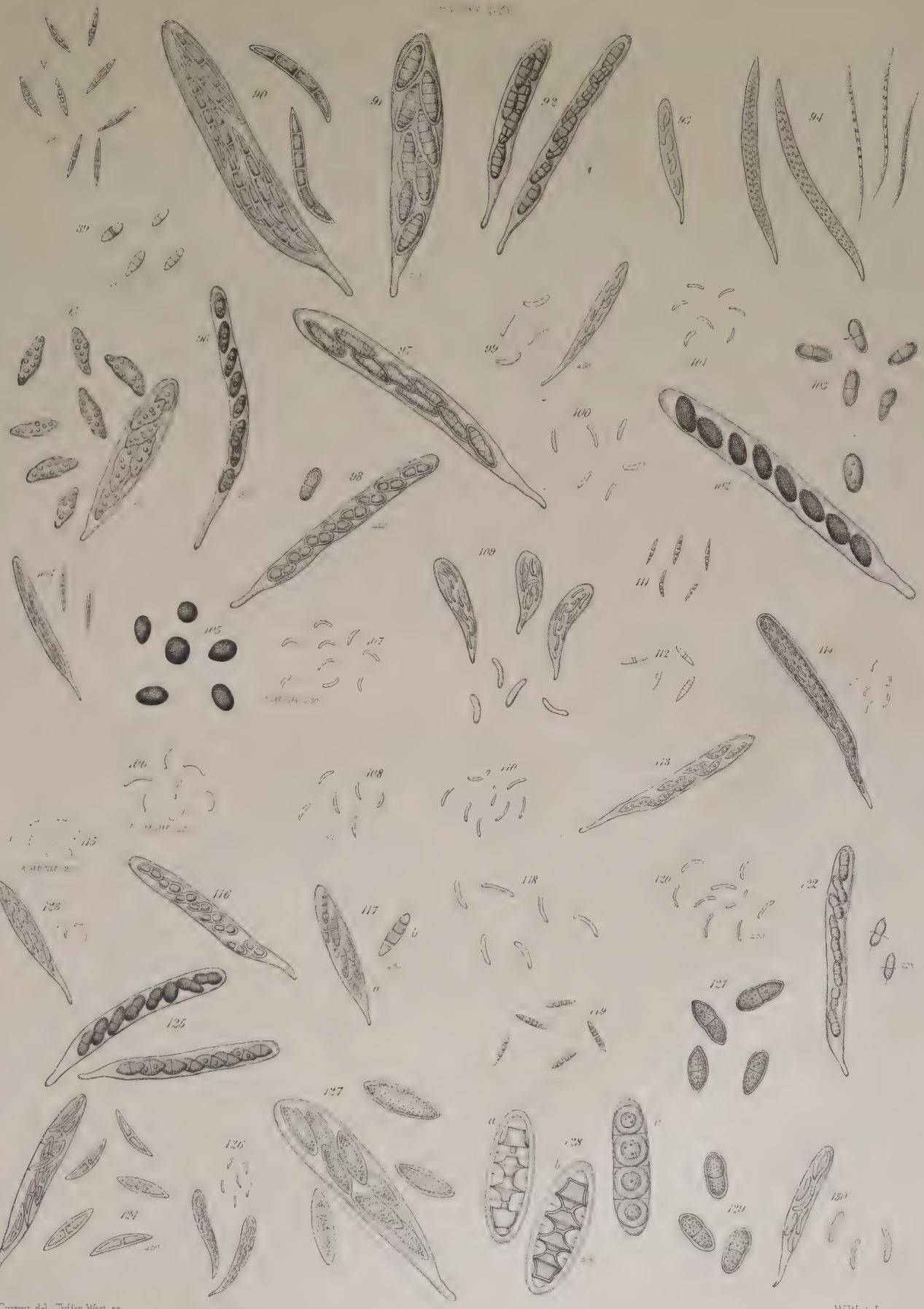

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W. West Imp

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GEN. SPHÆRIA

(Fig.s 131 to 171)

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GEN. SPHÆRIA.

(Figs. 172 to 213.)

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